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THE FAR EASTERN REVIEW

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REASONABLE EXPECTATIONS

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The Far Eastern Review

ENGINEERING FINANCE COMMERCE

VOL. XXXIII SHANGHAI, MAY, 1937 No. 5

Reasonable Expectations

By C. J. LAVAL

THE situation in the Far East and the complex relations between China and Japan lately have broadened in scope to such an extent that the main center of interest for a time shifted out of the Orient entirely and centered at the spot on which the eyes of the world were focussed, on the Thames, where a new British Monarch has just been crowned with all attendant pomp and ceremony. Activities in London through the Coronation period of both Japanese and Chinese representatives have brought British interests in China into special prominence and, related to this development, attention in the United States, as well as in other Occidental spheres, with regard to Far Eastern affairs has been awakened anew. Thus the Far Eastern situation rapidly is becoming a matter of paramount world interest.

From what has been happening in recent weeks, it appears to be probable that in new moves in China an Anglo-Japanese relationship will take form, and it follows logically that American interests will be linked with this development in consonance with a common British-American viewpoint. The American Government, it is known, has been kept fully apprised regarding the trend of the talks between British and Japanese diplomats.

A note of uneasy distrust runs all through the Chinese press comment on the Anglo-Japanese negotiations at London. News reports concerning these negotiations for a time stirred apprehensions in the breasts of Nanking leaders who thought they perceived under Anglo-Japanese inspiration, a drift of affairs toward the creation in China of " spheres of influence." These fears promptly were put at rest by official declarations. A British statement set forth that while Great Britain would cordially welcome an understanding with Japan with regard to China, a cardinal point in the British position would continue to be the strict preservation of Chinese rights and interests. It is said that further definite assurance was given to China that the Anglo-Japanese negotiations will by no means prove detrimental to China's interests, and supplementing this, a Japanese statement declared that Chinese interests could in no way be impaired in consequence of the London negotiations.

Only Preliminary Talks

It has been emphasized, both in Tokyo and in London, that no concrete program has yet been drafted or agreed to between Japan and Great Britain with regard to China. A series of conversations and conferences between the Japanese Ambassador to Great Britain, Mr. Shigeru Yoshida, and representatives of the British Foreign Office have been held, but these have all been in the nature of preliminaries at which simple exchanges of viewpoint have been presented. London news reports tell that a number of specific proposals, dealing with co-operation between Great Britain and Japan in China, have been formulated in Tokyo and are to be presented by Ambassador Yoshida in London. Opinion that seems to be best informed is that these proposals, if they have been forwarded to Ambassador Yoshida, do not envisage any modification of British policy in China, but have to do in large measure with phases of economic co-operation in China between Great Britain and Japan and with financial matters. They have no special bearing, it is said, on any of the outstanding political issues between China and Japan, which remain to be dealt with in negotiations shortly to be resumed in China.

On the subject of the Anglo-Japanese negotiations at London, one of the leading Chinese newspapers, the *Shun Pao*, of Shanghai, recently observed editorially that Great Britain is helping technically and financially to rebuild China, and at the same time is striving to co-operate with the United States in the Far East and to bring about an amicable solution of Sino-Japanese problems. The Chinese newspaper adds, in this connection, that it does not mean to imply that Great Britain is insincere in what she is doing, but points out that Great Britain is not doing all these things for China. In this connection and in studying the British viewpoint of the present day, it may not be amiss to observe that while new conditions have arisen, all the factors exist to-day that made an Anglo-Japanese Alliance desirable some thirty-odd years ago. The formula that Great Britain employed at the turn of the century to effect the American promulgation of the Open Door Policy in Asia is not practical under changed conditions of the present time, and, in fact, is unnecessary, since American concurrence with the British viewpoint is to be taken as assured.

Any comparison of actual holdings in China forces the conclusion that American interest in the country can be little more than idealistic and merely sentimental. The American material stake in China is dwarfed by those of Great Britain and Japan and is but little more than that of Belgium. The illusion of the " market of 400 million customers," it is true, persists, but the Chinese, instead of adding the traditional inch to the length of his shirt-tail, to set in motion the textile mills of the world, is in a fair way to lose his shirt unless the talked-of economic co-operation is forthcoming along with peace and order and help for the hard-driven rural population of the land. Such things might, indeed, change general commercial aspects and reverse existing conditions under which the United States has been sending back to China yearly about seven dollars for every dollar that American trade takes out of the country. Thus far, due perhaps to missionary and other influences in the United States, the American interpretation of ideals and principles has outweighed the importance of dollars and cents.

Safeguards in the Far East

No indication has been given that any active American participation is intended in events now taking shape in China. The problems in China properly lie between the powers with the biggest holdings, and it is to be seen as fortunate that an amicable understanding is being worked out between these interests and with China. It appears, in short, that Great Britain sees in Japanese friendship and in co-operation with Japan the best safeguards for her vast interests in the Far East, for her holdings in China that mount to a total of U.S.$1,189,200,000, and for her Far Eastern trade. Other even more important considerations may be adduced, tor a Red China under the dominance of Moscow is a contingency, however remote, that is as menacing and dangerous to Great Britain as it is to Japan. It seems only logical, therefore, for Great Britain to hold fast to, and to consolidate her dominant position and her undisputed leadership in engineering and in key industries in Central and South China, particularly since she can do this by yielding nothing more than a hand-shake with Japan, for Japan is claiming no monopolistic grip on North China and has no territorial ambitions within China.

In a recent address that he gave at a gathering in Tokyo of prefectural Governors, the Japanese Foreign Minister, Mr. Naotake Sato, set forth clearly the Japanese attitude toward Great Britain. "From the standpoint of our foreign relations in general," he asserted, "it is highly desirable to secure firmly our friendship with Great Britain." In the course of this address he referred to the widespread sentiment opposed to Japan that exists in China, saying with a note of regret that opposition to Japan had come to take the form of something like a slogan among the Chinese. He gave outspoken praise to the Nanking Government for its success in bringing various local administrations within its control and also for its achievements in financial and industrial rehabilitation. He said it is the purpose of his Government to dispel misunderstandings in China and to do everything possible to create a mutually friendly feeling between the two countries.

"By these means," he explained, "the Japanese Government hopes to establish mutually interdependent economic relations on the basis of the common interests of the two peoples." World conditions, he added, remain unsettled and in order to improve Japan's international position it is important to take "a comprehensive and co-ordinated view" of the international situation, strengthen Japan's relations with Manchoukuo and readjust relations with China and with Soviet Russia.

Japan's Policies in General

In an earlier statement that he read to a large group of foreign newspaper correspondents in Tokyo, on the occasion of his first meeting with them since he assumed his present office, the Japanese Foreign Minister covered the whole range of Japanese relations with the rest of the world. The text of this statement was as follows:

"More recently the international situation surrounding Japan is, I am happy to say, showing signs of gradual improvement. As for myself, I am trying my best to find solutions for the many knotty problems in our foreign relations and thereby to promote the peace of the world.

"I believe that Anglo-Japanese relations have taken a turn for the better since the amicable settlement of the Keelung affair, and the solution of the question of perpetual lease system. Moreover, the presence of H.I.H. Prince Chichibu at the coronation ceremonies of T.B.M. King George VI and Queen Elizabeth, will powerfully contribute toward enhancing more than ever the mutual cordial sentiment that has always characterized the intercourse of our two nations. I hope that the auspicious occasion will serve to strengthen this traditional Anglo-Japanese friendship, which constitutes one of the main pillars of world peace.

Common Sentiment Seen

"Since the Nanking negotiations of last year, no new development has taken place in Sino-Japanese relations. Only of late there are indications that the two countries are being animated by a common sentiment in seeking an amelioration of the present situation, and a way is being paved toward a better mutual understanding through more frequent personal contacts between our two peoples. I am convinced that the economic mission headed by Mr. Kodama, which visited China a short time ago, has accomplished much in this direction. We should, I think, seize every opportunity to promote a favorable and friendly atmosphere and make Sino-Japanese rapprochement and co-operation a reality.

"The adjustment of Japanese-Soviet relations is urgently needed. Since, however, both the Soviet Government and our Government are equally desirous of improving the present situation, it should not, I think, be necessarily a difficult task to solve pending issues if we go about it with perseverance and determination. I expect, in this connection, to have frequent conversations with Ambassador Yurenev, who has recently returned to his post.

"Our anti-Comintern agreement with Germany is, of course, rooted in the cordial friendship that unites the two nations. Although there appears to be some misunderstanding, entirely baseless as it is, about the agreement in certain quarters abroad, its aim is no other than that announced by the two Governments at the time of its conclusion. It is our policy to promote and perpetuate amicable relations with Germany, consolidating at the same time our friendship with all other countries.

Friendship Will Grow

"Between Japan and America there is no vexing issue, political or otherwise. The friendship of the two countries, which is firmly secured by their complementary economic and trade relations, is destined to grow with the years.

"In the field of trade and economic relations, agreements have been reached with the Netherlands Indies and with India. Furthermore, negotiations are in progress with the Union of South Africa, Egypt and other countries. As regards the question of a world economic conference which is now and then discussed in newspapers abroad, it is my sincere hope that through such a conference an opportunity will arrive as soon as possible to restore the freedom of trade which we have been advocating all these years, Mr. Kadomo and his party, who left the other day, are to meet personally and exchange views with the industrial and financial leaders of America and England. I expect that they will make no small contribution toward the economic rehabilitation of the world."

At this meeting of the Foreign Minister with the newspaper correspondents in Tokyo, the course that the coming diplomatic exchanges in China will take was more or less foreshadowed. It is assured that Ambassador Shigeru Kawagoe will return to China, probably not later than the first days of June. When Ambassador Kawagoe returned to Japan recently, he took upon himself all responsibility for the breakdown of negotiations in China and tendered his resignation. Foreign Minister Sato was unwilling to accept this resignation, however, and he prevailed upon Ambassador Kawagoe to continue with his arduous task in China.

Complete Unity of Purpose

It is believed, with good reason, that everything that might have the appearance of conflict of viewpoint with regard to China among the Japanese themselves has been eliminated, and a complete unity of purpose has been achieved. This is in line with recommendations that were put forward by Ambassador Kawagoe on his return to Tokyo, and this unity of purpose is emphasized in conclusions reached in discussions of Foreign Minister Sato with General Hajime Sugiyama, Minister of War, and Minister of the Navy Mitsumasa Yonai. Reports that deal more or less authoritatively with the decisions reached, as the result of these discussions, indicate that in the new instructions that Ambassador Kawagoe is carrying back with him to China, a completely new attitude toward China has been evolved that bears little or no relation to the past and especially to the negotiations of last year.

When Foreign Minister Sato was talking with the foreign newspaper correspondents who interviewed him, several questions that newspapermen asked touched upon the contention that the Chinese have been emphasizing so tenaciously—that political issues must be adjusted before matters having to do with economic co-operation between the two countries can be considered. It seems probable that the Japanese will meet the Chinese half-way on this point. Foreign Minister Sato told his questioners in reaffirming a purpose to deal with China on a plain basis of equality and reciprocity, that such questions as the situation in North China were highly complex and difficult, and necessarily could be adjusted only gradually and much patience. He affirmed as a reasonable belief that the wisest course to follow will lie in seeking to liquidate first matters of comparatively minor importance before passing on to graver issues, for he pointed out that if the lesser questions can be adjusted, the major problems will the more quickly yield to solution.

It is believed that when negotiations are resumed that the Chinese leaders will not find it consistent with their own prestige and with the position they have taken to call upon Japan to assert a definite authority in China and uproot the East Hopei Autonomous Government and the Hopei-Chahar Political Council, or set about undertakings more properly to be effected by China herself, perhaps with aid given by Japan on the strength of a new alignment of common Sino-Japanese interests. It is not to be expected that the Chinese again will fall into their error of the twenties when Baron Shidehara was exhausting every effort toward conciliation and friendship. The view that Japan's new amiability is to be construed as a "sign of weakness" will hardly be taken by the

clearer-visioned Chinese leaders of the present day who, with the harsh experiences of the past to guide them, have brought their country a greater power and prestige than it has possessed since the Chinese Republic was founded, and who will assess the changed Japanese attitude at its real value—as a course of simple common-sense calculated to yield the best possible values for both nations.

Japan's "Special Interests"

With regard to the general question of North China, it has been denied specifically in statements regarding the Anglo-Japanese negotiations in London, that anything like spheres of influence in China are now or have been contemplated. Japanese leaders have also made it clear that in speaking of "special interests" Japan has no idea of putting forward any claim to exclusive rights in North China. Assuredly, geographically and politically, Japan may properly claim to have in North China special interests that are unique, differing from the interests in that quarter of any other alien power in China. The basis for these special interests in North China are to be seen on the map, in the Russian fortifications that line the northern border of Manchoukuo and in the Chinese communist armies in the western fringe of provinces in China. These elements supply cogent reasons for the existence of Japan's special interests in North China and for the concern so frequently voiced by Japanese leaders for the maintenance of peace and order in that part of the world.

Thrown into the bubbling Pacific caldron, to spice it all perhaps, was the proposal put foward in London in the shank end of the month by Mr. Joseph A. Lyons, Australian Prime Minister, for the calling of a Pacific Conference to shape a regional non-aggression treaty. A lot of ink has been spilled to no apparent purpose, it seems, about the Japanese-German non-aggression pact, and, of relative importance, the question of a non-aggression treaty between Japan and the United States again lately has bobbed up momentarily. These things are diverting, but they signify little just now. Perhaps the political seedling that the Australian Prime Minister has planted will grow, blossom and bear good fruit. It all remains to be seen. It is to be observed, however, that everything that has been happening lately internationally is constructive.

At a farewell dinner that was given early in May, in Tokyo, to Sir Robert Clive, the retiring British Ambassador to Japan, who is being transferred from Tokyo to Brussels, Sir Robert expressed the belief that a closer understanding between Japan and Great Britain will, with patience, surely come. "I am convinced," the retiring British Ambassador said, "that before very long, by a policy of mutual understanding, and give and take—there must always be give as well as take on both sides—we shall arrive at a more solid and lasting solution of the problems confronting us."

Well—that's entirely reasonable.

Business Outlook "Reasonably Bright"

Hopeful View is Taken in Address of Chairman of the Hongkong and Shanghai Banking Corporation

In an address at the annual general meeting of the Hongkong and Shanghai Banking Corporation, the Chairman, the Hon. J. J. Patterson, reviewing economic conditions in the Orient of the past year asserted that "on the whole, the outlook for the future in the Far East is reasonably bright." The financial and economic views set forth in this address are given in the following :—

It is a relief that my task to-day is not to review the situation as it has existed in Europe during the past year. What I am called upon to do is to direct your minds to the countries in which we operate and particularly to China, where conditions have at any rate not been so depressingly tense as in Europe.

Let us start off with China. The year 1936 has in some ways been typical of recent years. It has again been one of changes, bright periods and periods of gloom, marchings and countermarchings. Nevertheless, the bright moments have definitely had the best of it and, although there will almost certainly be bad patches from time to time, yet we feel fairly confident that in due course, as the stability and authority of the Chinese Government become consolidated, the outlook will still further improve. It must not be forgotten how immense is the task of unifying and governing such a great country as China. It has often been pointed out that the proper comparison is between China and Europe rather than between China and a single country. This indicates that patience is needed and too much must not be expected yet.

Relations with Japan

Relations with Japan have again dominated the political scene, and the outstanding feature of the year is that China has maintained the *status quo*. In spite of difficult periods she has shown that she is more than ever determined to stand her ground. In North China, at any rate outwardly, there is little change to be seen. The Hopei-Chahar Political Council remains under the control of General Sung Cheh-yuan, and the autonomous regime of Eastern Hopei still exists under Yin Ju-keng.

Negotiations, or at any rate conversations, between the Chinese Foreign Office and the Japanese Ambassador, with a view to a fundamental readjustment of the relations between the two countries, have been proceeding in an intermittent way. The Chinese attitude has, if anything, stiffened up during the year, but there were occasions when compromise seemed possible. However, both sides were responsible for set-backs ; there were unfortunate incidents involving death or injury to Japanese on various occasions in different parts of China, and there were also set-backs caused by the attitude of the other side. Finally the seizure of Marshal Chiang Kai-shek at Sian and the subsequent developments in Shensi so preoccupied the Government that discussions were held up and the negotiations between the two countries remain for the moment in suspense.

The Sian Incident

The seizure of the Generalissimo at Sian on December 12, which the Chinese now refer to as the Double Twelfth affair, came as a great shock to China, and although he was released within a fortnight, a tragedy was at one time feared.

I believe that the Generalissimo has repudiated the title of Dictator. All the same his influence is felt everywhere in China, and either directly or indirectly his hand can be traced behind most of the progressive schemes of development which have been initiated during the last few years. He has done much for China, and his removal would be a serious blow to the progress recently made. Prior to the Sian incident the country seemed to be reasonably quiet and the Central Government firmly installed, but since then there has again been uncertainty, though the Plenary Session of the Central Executive Committee just concluded has, we trust, cleared the air.

I must before passing on mention the change which has taken place in the status of Kwangtung. Here in Hongkong we are particularly affected by the transfer of control, and it has been a matter of considerable interest and importance to us. We are glad to see how firmly and yet adroitly the Generalissimo dealt with the situation prevailing last summer, and whilst we do not expect, and indeed do not want, very rapid changes—the situation is still too impermanent for that—we look forward to close collaboration between Hongkong and Canton in all inter-connected matters and trust that the good foundation laid by his Excellency Sir Andrew Caldecott, when he visited Canton last year, will be productive of benefit to both sides.

Your board of directors fully associate themselves with the many public expressions of regret at the transfer of Sir Andrew to Ceylon after so short a period as the Governor of this Colony.

Our loss is their gain. We feel sure that he will win the confidence and esteem of Ceylon as quickly as he did of Hongkong.

Currency Questions

I will now turn to currency questions. In Hongkong we started the year with exchange at 1s. 3½d., rising to 1s. 3⅝d., where it remained until the middle of May. By the middle of September the rate declined to 1s. 2¾d., but recovered to 1s. 2⅞d., at the end of the year.

After a full year's trial we may say that our new currency has worked most satisfactorily, with a minimum of fluctuations, which has been a great help to merchants.

As you all know, China is no longer on a free silver currency standard. Her currency system may perhaps fairly be termed a managed foreign exchange standard, although her currency reserves are in fact partly in foreign exchange, partly in gold, and partly in silver. But the connection with silver is a precarious one in spite of the declaration of the Government on May 17 last that 25 per cent of the reserve held against the note issue would be maintained in silver. It is true that silver dollars, of the old type, still circulate as a medium of payment in some of hoarded, the more distant parts of China, and fair quantities are certainly but it is probable that in time these will be melted down or come into the hands of the authorities. In due course the Government is expected to issue silver token coins, but none of these have as yet been minted.

Use of Silver

The arrangements with the United States made by the K. P. Chen Mission last summer, full particulars of which have not been revealed, provided, so far as is known, for the purchase by the United States of regular and substantial amounts of silver at the average monthly world prices, whilst China on her side agreed to enlarge the use of silver and maintain an independent currency system unlinked to any foreign monetary unit. Thus it will be seen that silver has not yet been entirely cast off, though its future influence in China seems likely to be small. The foreign banks, with the exception of the Japanese, handed over all their silver against legal tender notes early in the year, but no information is available as to the actual stocks now held by the Chinese Government. Considerable amounts have, of course, been disposed of. The legal tender note issue at the end of the year was about $1,100,000,000—which excludes the issues of the commercial banks whose notes have not yet been entirely recalled, and of the Farmers' Bank, the position of which is somewhat obscure. According to the reports of the Currency Reserve Board, fully 60 per cent cover against the notes of the Government banks is held in "cash," which term includes foreign currencies. These legal tender notes are now current in every province throughout China in varying degrees of popularity and they are steadily replacing other forms of currency.

Skilful Management by Central Bank

Sir Frederick Leith-Ross has stated that the Chinese monetary reforms have been justified by their results. Everyone will agree that so far there has been no hitch, but rather there has been every sign of skilful management by the Central Bank. Occasional political scares have caused speculative manipulations, but the official rate has nevertheless been maintained without wavering, and the resources at the disposal of the Government banks have proved adequate. During the whole of 1936 the rates in Shanghai for the pound have remained between 1s. 2¼d. and 1s. 2 $\frac{19}{32}$d., a difference of only $\frac{11}{32}$d., whilst the U.S. dollar rate has ranged from 29½ to 30¼. These differences can be attributed in part to fluctuations in the London-New York cross rate.

I will deal with the trade figures later on, but it is obvious that the lowered rate of exchange has encouraged exports, and although imports have been adversely affected, nevertheless the steadiness of exchange has to some extent offset this disadvantage. I cannot do better than quote Sir Frederick Leith-Ross's opinion of last June when he said :—

"All things considered there would appear to be every reason so far as economic factors are concerned for confidence in the present currency scheme, provided that the Chinese Government complete and carry through efficiently the program of internal reforms including especially the reorganization of the Central Bank and the reform of the budget."

Measures of Reform

There was much more in Sir Frederick's admirable statement which still applies with great force. He referred to the necessity of unification of the note issue, to the dependence of the currency on internal stability and to a settlement of the special situation in North China which has been, and still is, a potential danger to the Customs revenue. We understand that the Government is taking in hand the essential measures of reform which were in fact promised by Dr. H. H. Kung on November 3, 1935, and whilst progress may seem to be slow it is realized that Governments have many difficulties which are unknown to those outside the inner circle.

We trust, however, that it will not be long before some announcement will be made of the action taken. Managed currencies are liable to be a serious danger to merchants and bankers if the "management" is not founded on a firm and solid basis such as is implied when there is an independent Central Reserve Bank and a well regulated budgetary system. Without such a basis "management," like monopolies, tends to become the plaything of politics instead of following natural values. Moreover, one kind of "management" leads to another. It becomes a kind of whirlpool drawing into its control industries, imports, exports, and so on until rigid State control reigns supreme.

We, of course, realize that there are few countries with a completely independent Central Bank system and that consequently politics often play a permanent part in currency matters. For this reason it will be obvious to you that very great importance attaches to the actual terms of the new Central Reserve Bank Act, which will be keenly scrutinized by all who are interested in China's currency and finance.

Signs of Recovery

If conditions in China keep up the steady improvement which has been made recently, and if unification of the country is maintained and internal strife is avoided, perhaps China will be more willing to allow free play to the natural forces of supply and demand. The signs of recovery are clearly apparent and the excellent crops throughout the country have been a great boon, coming as they did at a time when exchange had just been fixed at a reasonably low level and when the demand for China produce was improving abroad. As a few instances we may mention the improvement in Chinese commodity prices, the rise in yarn, the demand for piece-goods, which has resulted in the reopening of closed cotton mills, and and encouraging progress reported by utility companies.

Shanghai is, however, still faced with one serious handicap to entire recovery in the deadlock that exists in regard to its mortgage and real estate problem, with which is bound up the question of the right of landlord *vis-à-vis* tenant. There are anomalies in the laws governing these matters which require to be straightened out. Chinese property owners are just as much affected as foreigners, and we trust that the legislative authorities will deal with these points shortly, as we believe they are being urged to do.

The Internal Debt Consolidation Scheme

Early last year an internal debt consolidation scheme was presented to and accepted by bondholders, whereby the interest rate on domestic bonds was reduced to 6 per cent, and amortization schedules were considerably extended. About the same time a recovery loan of $340,000,000 was placed with the Government banks. Since then the Government have had no recourse to the domestic bond market, but have covered their requirements by other means. There have, however, been a number of provincial and railway bond issues, some of which have been secured on revenues of the Central Government.

Excellent progress has been made throughout the year in the settlement of foreign debts in arrears. Apart from the steps taken to clear off numerous commercial debts due by Government departments, the initiative taken by the Governor of the Bank of England in forming a Chinese Railway Bondholders' Committee in London has proved to be of great value and assistance. As a result of negotiations initiated by the Ministers of Finance and

Railways, terms of readjustment of the Tientsin-Pukow Railway Loans, the Honan Railway Loan, the Lung Hai Railway Loans, and the Canton-Kowloon Railway Loan have been recommended by the committee for the acceptance of British bondholders. These offers have in every case been well received in London as being the best obtainable in the circumstances.

Hukuang Railways Loan

A settlement of the Hukuang Railways Loan has been complicated by the international nature of the flotation, but an announcement may be expected in the near future. A settlement of the Vickers-Marconi debt has also been negotiated by another committee, and at the present moment it seems that all Chinese loans floated in London excepting the Hukuang have been readjusted as satisfactorily as can be expected. In the first few years the resultant charges on the Ministries of Finance and Railways are quite small, and this gives time for the Government to complete their plans for the rehabilitation of the finances of the country, which we see no reason to doubt can be done if political stability is assured.

Improved returns have been reported by the Salt and Internal Revenue Administrations, whilst the increase of $9,000,000 in the Customs revenue for 1936 came as a considerable surprise in view of the smuggling in North China which was known to have seriously affected the collections in Tientsin and the northern ports. The Customs authorities have on the whole successfully prevented the transportation of smuggled goods southwards, but in the East Hopei district there has been practically no easing of the situation except as and when the saturation of supplies has caused a temporary slow-down in the smugglers' activities. Whatever measures the Customs take can only be palliatives, and no real solution will be possible until the political status of the East Hopei autonomous area is settled by diplomatic negotiations.

Customs Administration in North China

It is recognized that the Customs Administration have throughout the year been confronted with unprecedented difficulties in North China, and the integrity of the service has from time to time been seriously threatened. But by the exercise of great resolution coupled with tact, Sir Frederick Maze has succeeded in maintaining the authority of the Customs inspectorate in the midst of much political confusion and unwarranted interference with its legitimate functions. The Customs service have a fine record and again and again have they remained practically the only outward and visible sign of the prestige and sovereignty of the Central Government in regions where otherwise independent regimes existed. This record has considerable significance from a financial standpoint and has contributed very largely to the confidence placed abroad in loans secured on the Chinese Maritime Customs.

The last published financial report of the Chinese Government related to the fiscal year which ended on June 30, 1935. The deficit for that year was $196,000,000. As regards the year 1935-36, an official statement has declared that the deficit was larger than the previous year; nevertheless the Budget for the year 1936-37 only provided for $125,000,000 as proceeds from loans. Without official figures it is impossible to say more, but the recent improvement in the purchasing power of the people should have a favorable effect on revenue receipts, both of the Internal Revenue Administration and the Customs, through an increased demand for internal consumption goods, as well as for imports.

Development Communications

References have in past years been made by my predecessors to the great progress in the development of communications in China. The cumulative effect of these developments is now making itself felt, and the country is being opened up in a remarkable way. It is now possible to cross China by railway, by motor, or by air. It is possible to telephone or radiophone direct from here to Shanghai and from Shanghai to Japan, Nanking, Hankow, or any one of nine adjacent provinces. Radio broadcasting stations are almost excessive in their number, but their influence is being widely felt, for instance, in the broadcasting of market prices to up-country farmers who are thus less and less under the thumb of the middleman.

From the bank's point of view the progress in railway construction is of special interest. Since the present Minister of Railways took office in December, 1935, many very important and extensive projects have been put under way. His ambition is to complete 5,000 miles of new railways within five years, and thus practically to double the existing system within that period. At the same time he has been bringing his business training to bear on the problems of the existing lines and he has the good fortune to point to record earnings on those two very important lines, the Peiping-Hankow and Tientsin-Pukow Railways.

Some of the agreements made by the Ministry during the year for railway construction have been on a comparatively short term and somewhat uneconomic basis, but we understand that the Chinese Government argue that it is essential to press forward on whatever terms they can best obtain credits. Their view is that many of their most serious problems will be automatically solved if means of communication can be developed rapidly. It stands to reason, of course, that the Government will gladly avail themselves of sounder and more economical finance as soon as it is available.

Trade Situation

As regards the trade situation in China, the most significant change is that to be noted in the Customs figures of the export trade which last year amounted to $706,000,000. This is 22 per cent higher than the year before and, excluding Manchuria, the best result shown since 1931. Imports increased $22,000,000 in value, but this improvement was entirely due to the higher rate of the Customs gold unit in terms of Chinese dollars, which averaged $2.26 in 1936 as against $1.80 in 1935. In terms of Customs gold units imports actually show a reduction of 85,000,000 of gold units.

The adverse trade balance was just under $236,000,000, which is the lowest figure since 1919, when China exchange was almost at its peak, and it compares surprisingly with the figure of $1,087,000 in 1931, when exchange was at its lowest point. Any estimate of the international balance of payments must, in view of the continued lack of reliable statistics, remain highly uncertain, but the improved conditions in Malaya, the Philippine Islands, and the Netherlands East Indies, are likely to affect remittances from overseas Chinese favorably, and the balance may well prove to be in China's favor.

During the early part of the year trade conditions did not appear to warrant any optimism except as regards certain export commodities in which America was taking an interest, particularly wood-oil, but towards the autumn a definite change become apparent. The demand for Chinese produce remained steady, and, added to this, the effect of the good crops, to which I have already referred, began to make itself felt.

Good Crops

In many parts there were in fact bumper crops. In the Yangtze Valley the rice yields were exceptionally good, and have been estimated as 30 to 40 per cent above the normal average. The wheat crop, said to be about 500,000,000 piculs, was fair, though not up to the best records. The cotton crop passed all records by a good margin. The production is estimated to have reached about 14,500,000 piculs of 133 lb., which is over 3,000,000 piculs higher than ever recorded in the past. The acreage under production is further estimated to have increased at least 12 per cent over the previous high mark. Much of the credit for the good cotton crop must be given to the National Economic Council.

The improved demand for wood-oil has made that commodity the leading one in the list of Chinese exports, beating all records both in value and quantity. Other export commodities show improvements, especially tin, but one feature of the year is the trend towards monopolies and State control in the export trade which is partly due to the conclusion of barter agreements with foreign countries. The economic wisdom of this policy is of course very doubtful, especially in China, where administrative experience is lacking and other internal difficulties abound.

Import Position

The import figures which I have given might not seem to warrant much optimism, especially as an analysis shows that in

many cases where progress can be traced it was due to purchases on account of the Chinese Government. Nevertheless it is clear that by far the larger part of the drop in imports was in those goods which China is well able to, and now is, producing herself in larger quantities—namely, rice and wheat, raw cotton, and cheap cotton goods (imports of the latter are incidentally at their lowest point for a great many years). The effect of the improvement in the internal situation was only just beginning to be felt at the end of the year but import merchants are generally agreed that the outlook is now more promising.

Situation in Japan

The situation in Japan does not on the face of it make for optimism, and persons trained in economics are making the gloomiest of forecasts as to the outcome of the political, financial, and trade situation as it exists at present. It is impossible to foretell how the political situation will develop, but we hope for the best. As regards the Budget, we must confess to misgivings. But as regards trade, the position hardly seems to warrant pessimstic conclusions. Last year's figures again showed considerable expansion and compare very favorably with those of many other countries. Exports have increased about 8 per cent in spite of the handicap of tariffs and quotas, whilst the visible adverse balance of trade is believed to have been covered by invisible receipts. Shipping has been very prosperous and the tourist trade greater than ever.

The drastic exchange control measures instituted on January 8, of this year, aimed at dealing with the nervousness in the exchange market caused by the unbalanced Budget and the prospects of heavy buying abroad to cover Army and Navy requirements. These measures should result in a better balance between imports and exports, but there are no indications of any serious check in the expansion of trade throughout the present year.

Trade in Malaya

In Malaya, as in China, trade began to look up in the second half of 1936, mainly because of the better demand for the two chief products—tin and rubber. Prices have been at remunerative levels for producers, and the prospects for the present year are promising.

In the Philippine Islands political conditions have been normal, and the business community feel confident that they will be able to operate without legislative interference. The boom in goldmining has been coupled with higher prices for the main local commodities, such as sugar, copra, and hemp, and as a result the export figures have increased considerably, whilst the financial position of the Government has also improved. Increased taxation on the production of mines and on corporate incomes may affect the importation of foreign capital, but the outlook is, generally speaking, good.

Reasonably Bright Outlook

In conclusion, may I just remind you that in times of difficulty wide differences of opinion are to be expected in business circles, and more especially do bankers and their constituents find points of disagreement. It must be remembered that the last few years have been an exceptionally trying and uucertain period. The world is now emerging from its difficulties. Some countries have come through better than others, and the Far East has come through better than many parts. On the whole the outlook is reasonably bright, but it is not safe to prophesy what the future holds in store. For ourselves, our desire and our duty is by collaboration with those of like mind, whether in China or in the other countries in which we operate, to work for a steady expansion of international trade, and more especially of British trade, whilst continually aiming at upholding the world-wide prestige of British banking.

* * *

Supplementing the foregoing additional evidence of improved conditions in the world of banking and commerce, is to be found in the address given by Mr. A. d'Anyers Willis, Chairman of The Chartered Bank of India, Australia and China, on the occasion of the Eighty-third ordinary general meeting of the shareholders in London recently. Pertinent portions of this address are given as follows :—

Since the slump of 1931, a great shrinkage has taken place in the volume and value of British export trade. This shrinkage has been mainly due to the effects of " Economic Nationalism " which has resulted in the establishment in most foreign countries of quotas and exchange restrictions, preventing the free movement of manufactured and capital goods. The increased prices now being obtained for primary products, in most foreign countries in which we are interested, have produced a greater purchasing power. Resulting from this prosperity, it may be inferred there will be a tendency for a new or an increased demand for these very goods, the supply of which, hitherto, has been the mainstay of our overseas trade. Doubtless, in this connection, I must take into consideration the manner in which our home trade continues to expand and how the consumption of domestic goods and purchasing power go on increasing ; also how industrial expansion is proceeding at a great pace all over the country, due, without a doubt, directly or indirectly, to the Government rearmament scheme. No matter how much we realize, on peace grounds alone, the necessity for our rearmament program, it does not follow that the industrial structure, which has been created as the result of it, need be on a healthy business basis nor its durability extend beyond the life expected of it.

It is natural that export trade should seem less important when domestic trade is expanding, but for the above reasons I wish to emphasize the desirability of serious attention being devoted to overseas orders, especially as, should they be neglected now, they may not be available when the present abnormal domestic conditions have disappeared. I still hope at least when the overseas demand is not in actual conflict with domestic trade, it will not be entirely ignored, and that every effort will be made to retain a fair proportion of our pre-War supremacy in this direction. Bearing on the subject of the extension of foreign trade, the Ottawa Agreements, which expire in August this year, are shortly coming up for review. If, beyond the limits of the Empire, the scope of overseas trade can be widened by inviting other countries desiring freer trade to negotiate for a reciprocal lowering of the existing barriers, something definite may be achieved in furnishing a definite impetus to the volume of the world's commerce.

Position in India

Under the new Constitution, it is to be hoped that responsible Indian opinion will move along the line of effective co-operation, and in the end justify the responsibility which our Indian friends have now attained in the Government of their country.

India has given notice of terminating the Ottawa Pact, and a new trade agreement between her and Great Britain is now under discussion. Incidentally, the Japanese Government is also negotiating a fresh agreement, to take the place of the existing one, which expires this month. The result is of great importance to Lancashire with regard to her export of textiles.

An analysis shows that whereas in 1929 the United Kingdom exported 1,374 million square yards of cotton piece-goods to British India and Burma, the quantity had fallen to 485 million square yards in 1933, while the figure for 1936 had dropped to 416 million square yards.

Recent statistics indicate that 80 per cent of the total piece-goods consumed in India are now produced by Indian mills and hand-looms, and the balance of 20 per cent is imported from Lancashire and Japan.

The high level of Indian protective duties continues to give Indian-made goods an overwhelming advantage over those manufactured in Lancashire, and, so far as the better qualities are concerned, current prices are beyond the range of prospective consumers.

It is to be hoped that, in view of Lancashire meeting India in the matter of increased purchases of her raw cotton, and taking into consideration a connection extending over a large number of years, with a complete understanding of local conditions, India will yield to the British market terms which Manchester will consider fair and reasonable.

India's export business is rapidly improving at higher price levels, due to the steady and increasing world demand for her products. It is interesting to note that the total imports were the lowest since 1930, with the exception of 1933, when they had declined to Rs.116 crores. On the other hand, the exports are the highest during the last seven years, except in 1930, when they amounted to Rs.257 crores.

Other Countries

Exports from Ceylon indicate a definite improvement in the last three months of 1936. Tea and rubber from the Customs

return of 1936 show an increased valuation over the 1935 figures, but in comparison, the quantity of rubber exported is down by 3,864 tons last year. Coconut prices were generally higher, but the total yield from the produce was nearly Rs.20 lacs less, owing to shortage of crop. Generally speaking the trade outlook is favorable.

In British Malaya a general all-round improvement has taken place there during the past year. The ill-effects of the slump have now all but disappeared, and with rising prices of all her commodities there is an air of prosperity and a feeling of optimism for the future, which is in distinct contrast to the gloom of the past five years. Both the Straits Settlements and the Federated Malay States have large accumulated surpluses, and their Budgets continue to be framed with great caution. I am sure we all welcome the return to prosperity of the Dutch East Indies, which shared to the full the ill-effects of the recent depression.

Position in China

In happenings in China, which have made the greatest impression on the Western banking world in the last year or so, probably that of the change in China to a managed currency, stands out relatively as the most important. In last year's speech, misgivings were expressed regarding the ability of the Chinese Government to maintain a managed currency. So far the arrangements have been successful, and, if aided by a healthy export trade, and provided that no major political upheaval takes place to challenge the authority of the Central Government, there seems no reason why they should not continue to be a success.

At the time the currency reforms were introduced in November, 1935, the Government announced its intention of converting the Central Bank of China into a Central Reserve Bank. So far this essential safeguard to the control of the note issue and to the effective supervision of the Commercial Banks—free from all political bias—has not been introduced, although I believe the matter is receiving attention.

The note issues of the three Chinese Government Banks which at the moment constitute legal tender, circulate freely in most parts of the country, controlled from Nanking. No doubt the right to issue notes by other banks in certain parts of China will be withdrawn in due course. I have every reason to believe that the Government reserves of foreign funds, built to a great extent, I should say, from sales of bullion, are intact and have not been depleted in any way by the events of the years, which is all to the advantage of the currency control. According to Customs returns during 1936, net shipments of silver were $249.6 millions, while gold shipments stood at $40.6 millions.

Reverting to financial matters, as might have been expected, the Ministry of Finance, according to the figures of last June, have not been successful in securing a balanced budget. Every endeavor has been made to increase the national revenue, but the lack of proper political organization in the country, and the difficulty of imposing an equitable system of direct taxation present difficulties which only time can overcome. In this regard, I think we can fully sympathize with China when we realize that the Maritime Customs, under a very efficient foreign Administration, have not been able to function as they were entitled in Northern China, with the result that the collection of full Customs duties has been interfered with, and the revenue of China as a whole has been made to suffer. On the expenditure side, the allocation for Army maintenance is still proportionately high, but the Central Government, to ensure the requisite control, have not found it possible to bring about any reduction. Under the able leadership of the Chiang Kai-shek Administration, good progress continues to be made, and the liaison which Nanking has now established with the Provinces of Kwangtung and Kwangsi is a co-ordination in the right direction, adding strength and power to the Nanking Authorities.

Better Trade Outlook

To refer briefly to trade, I am very pleased to note that during and since the last quarter of 1936 a growing demand has arisen for China's products at enhanced prices, which, aided by a steady exchange, has made an encouraging change in the outlook for China generally. With a shortage of crops in other parts of the world, China has benefited and we begin to realize her advantage on the estimate that her crops, harvested last year, are worth $3,000 millions more than the crops of 1935.

The returns of China's foreign trade for the year 1936, show imports valued at $491,000,000 and exports at $706,000,000, compared with $919,000,000 and $595,000,000 respectively in 1935. The excess of imports thus amounted to $235,000,000 in 1936, compared with $324,000,000 in 1935. Making allowances for differences in exchange, etc., I find an important improvement has taken place in China's trade position since our last meeting.

Opportunities for Britain

It is gratifying to observe that Export Credits Guarantee Department of the Department of Overseas Trade has recently sent to China a representative to explore and report upon commercial opportunities for British manufacturers. For some time to come, China is likely to be an important market for capital goods, and in particular, for machinery, to equip the new industrial plants that are being created under the supervision of the Ministry of Industries. A great deal of industrial progress is being made under the aegis of nationalized and semi-nationalized corporations.

Although one recognizes that "collectivization" is an important economic tendency in modern times, in the light of experience the Chinese authorities may, before long, realize the fallacies upon which arguments in favor of State control of industry are based. The Chinese are a hard-working race placing great reliance on individual effort and reward, while their social organization rests upon what is known as the "family system." These inborn traits would seem to clash with the ideas of State-managed industries and indicate that more efficient management and better results are more likely to be obtained from private enterprise.

Japan

Japan has had a difficult year, both from the political and economic point of view. The higher prices of the raw materials she imports for her manufacturing industries have recently put a strain on the exchange value of the yen. There is necessarily a time-lag before the higher value of her exports adjusts the position. I am glad to see that she is arranging for part of her gold reserves to be shipped abroad to strengthen her exchanges. This is a wise step, as, after all, reserves are of little value unless brought into front line defences when necessity arises.

The Finance Minister stated in Tokyo last month that the value of the gold reserve of the Bank of Japan was 1,700 million yen (say 100 million pounds), as against a note issue of 1,400 million yen. The annual production of gold in the Japanese Empire is stated to be about 100 million yen.

New Motor Roads

Touring the far-flung parts of China by automobile—an over-ambitious dream a little more than five years ago—is to-day more or less a practicality as a result of the extensive highway building work put into effect by the National Economic Council.

Into the heart of the country's hitherto out-of-the-way districts, engineers and workmen of the N.E.C. have carved roads which form important links in China's highway network.

During the five years when the N.E.C. officials have been concentrating their money and energy on road-building, they have completed no less than 11 trunk highways, with a total length of 21,350 kilometers. All these roads are now open to traffic.

Now being constructed are some 2,180 kilometers of additional highways, which form part of the branch roads included in the 11 trunk lines.

To-day, a resident from Shanghai, if he chooses, may go by automobile on the newly opened highway to Kwangsi. Traveling by this route, the motorist will go through Kiangsu, Chekiang, Kiangsi and Hunan. Cars are now able to go along the main route through Kiangsu, Chekiang and Kiangsi. In Hunan, the motorists may take a short detour from Chalin to Hengyang.

Also, a large portion of the Kaifeng-Canton route is also open. Travelers leaving the Honan city may go direct by car to Hankow. From Wuchang, the motorists may reach the border of Kiangsi through Tayien. The route through Kiangsi will be opened completely in the near future. Through this road, the traveler can go from Hankow to Lungchow, Kwangtung, direct by car.

The Nanking-Foochow Highway is open from the Capital to Wenchow. From that city southward, the road is now being built. Traffic will be open within a short period.

China's Railways

By BRUNO KROKER

In present days, China, being merely in the beginning of the construction of a thorough railway network over her vast territory, is already found at the critical point of the railway age. Her first technical means of communication, the railway, is under pressure of other improved means of communication, not least under the influence of the construction of fine highways for motor-cars, compelled to give the maximum performance.

Both the Nanking-Shanghai and the Shanghai-Hangchow-Ningpo Railway Companies registered a drop from January to February this year in the tonnage of goods transported. It appears that China's two Aviation Companies, The " Eurasia " as well as the China National Aviation Corporation, made spectacular headway in the number of passengers and the amount of freight carried, as compared with a year ago, and also with the previous month. On top of all this, the combined figures of several rural bus-companies indicate that the number of passengers carried on these lines was much larger and increased tremendously in the course of the last year.

The construction of highways for rapid transit, according to a systematic plan for the whole country, began with the establishment of the National Government in Nanking, in 1927. But it was not until 1932 that it made a modest beginning in working upon an elaborate project which linked up the important commercial and political centers of Shanghai, Hangchow, Nanking, Wuhu, Hweichow, etc., in the provinces of Kiangsu, Chekiang and Anhwei. It is thus that China has, to-day, 24,259 km. of paved roads and 85,490 km. of earth roads capable of motor traffic ; 16,165 km. under construction ; 45,979 km. projected, making a grand total of 171,803.

Whereas the construction of railways, started in China as early as 1876, with the breaking of the ground for the line connecting Shanghai and Woosung, the country, with a territory of some 4,376,000 sq. miles and a population of over 400,000,000, has, after 60 years of constructing and projecting, only about 10,000 km. of railways actually on the map, about 5,000 km. under construction besides numerous lines in form of paper plans.

On the occasion of the graduation of the Railway Training Class at the Loyang Military Academy, General Chiang Kai-shek, President of the Executive Yuan, delivered an address in which he says :

> " Whether the system of railway communication is good or bad, has a great bearing on the economic and cultural conditions of the country. The reasons why our country has been so weak are many, but the most important one is the meagre development of her railways. Even in operating her mere ten thousand or more kilometers of lines, darkness and corruption prevail. No reforms are attempted, and no efforts made to increase operating results. Not only are they incomparable with the railways of other countries, but the very state of their corruption make our foreign friends slight us saying : China is not a modern nation and not hesitating to invade and oppress us at will. It should be noted that whenever a foreigner wants to find out whether the organization of our state is efficient or otherwise, whether our Government is strong or weak, and whether our people are intelligent or ignorant, it is not easy for him to find this out ; but as soon as he sees our railways he can make an immediate, accurate judgment as to the real conditions of things. From our railways, he can easily see whether our railway staffs from station-masters, trainmasters, booking clerks down to railway police and workmen, are energetic, orderly, polite in speech and deportment, aed have enough intelligence to perform their duties. . . . . and whether the furniture and fixture in the trains and on the stations are clean and well arranged."

The recent railway exhibition at the City Museum of the Municipality of Greater Shanghai, should serve to quicken the interest among the Chinese people in the important question of railway construction. Since the National Government took over power, a good deal has been achieved to put the existing railways on a better basis and to construct new lines, but it is not perhaps generally realized how far behind, China still is, in the extent of her railways. The total mileage of railways in this country as above mentioned is less than 10,000 compared with 24,000 in Britain, 39,000 in France, 36,000 in Germany and 43,000 in India, while the United States has some quarter of a million miles of railways in operation.

As aforesaid, the Government has been concentrating largely upon highways, as these were considered as being most urgently required ; it is manifest that a good deal of new railway construction ought to be launched in the not too distant future. Railways play a specifically important rôle in the opening up of new areas to the benefits of modern civilization and agricultural and industrial reconstruction, and when we recollect that there are several provinces without a mile of railway, we may get some notion of the gigantic task that lies before the country. However much traffic is carried on the highways, the fact cannot be ignored that good railways, with fast and regular services, are very essential links in the system of communications.

All large centers in China, there can be no doubt, ought to be joined up by such lines. Unification would be far more real if this were the case. It was to assist in making people " railway-minded " that such an exhibition, as was held in Shanghai, was thought of. The appointment of Mr. Chang Kia-ngau as Minister of Railways in December, 1935, has already led to an awakening of greater interest among the average Chinese in railway development and Mr. Chang's zeal and energy and keenness to get the economic basis of the railways in better shape has been reciprocated by others. The Generalissimo's condemnation of dilatory methods and slackness among the railway staffs—as shown in part of his speech, reprinted above,—in the more out-of-the-way places has also borne fruit, and at the present time it may be claimed that China's railways are no longer under the cloud that they were a few years back—chiefly as the result of military interference, in the course of the country's civil wars and consequent financial chaos.

It is of rather melancholy interest to learn that the field of railway construction in China is somewhat handicapped by the lack of standard terminology in the Chinese language. In this it shares with other departments of applied sciences what is undoubtedly a troublesome factor, but which is one that can be conquered by effort. In the field of medicine, it is said that the Chinese language is now equipped with a generally accepted scientific terminology which is practical and convenient, and that in other fields of human endeavor there has also been much progress in a similar direction. In some cases there have been Government commissions appointed to assist, although it is said that the results of their endeavors have not always been as good as one might wish. In the case of the railways, it should not be difficult for the Ministry of Railways to secure a standard nomenclature and phraseology which will leave no doubts in the minds of those using them. Not only should a standard terminology be speedily adopted but it should be published far and wide so that ordinary people, who are not railway technicians, may get to know the proper expressions in use for various objects and functions.

A formidable difficulty in the way of securing a considerable extension of China's railway net work in the near future is the want of funds. There can be little doubt that many lines could be built which would show good profits in a few years if the capital were available to build them on really favorable terms. But there are so many plans of reconstruction going forward that the amount of money which can be found immediately is strictly limited, while resort to external borrowing is not popular with the Chinese people —even if good terms were obtainable. The general impression prevails that it will take some years of steady, uphill work, before it can really be said that China is out of the woods in regard to her railway system. The present Minister of Railways has accomplished a great deal, but miracles cannot be expected.

Large Chinese Orders for Britain

ONCE again, the East is displaying its enormous powers for recovery. The most densely populated quarter of the globe, it is on the eve of a trade revival of the kind that has periodically amazed the West for countless centuries. China, India, Malaya, Burma and the surrounding countries are, without exception, always the worst hit and the last to be hit by economic disturbances, being dependent upon fickle crops for their national welfare. How badly the last great depression hit them is common knowledge. Now the old skin is being sloughed and a new one grafted in its stead.

Probably no business men are more able to detect the swing of the economic pendulum than the bankers, and their recently expressed opinions show that confidence can be placed in the immediate future of the Eastern markets.

Thus, discussing Far Eastern commercial prospects at the annual meeting of the Hongkong and Shanghai Banking Corporation, the Hon. J. J. Paterson, chairman, supplied proof of the important contribution this quarter had made to the world's recovery as a whole. Last year had been a year of good crops, and the spending power of the people had risen.

Mr. Paterson referred to the remarkable progress made in the development of China's communications, and declared that the cumulative effect of these developments is now making itself felt. This news is most encouraging. It is an axiom that trade follows the road. Lack of communications has been the main curb to China's trade expansion for centuries. With good roads and good railways, the whole of this vast territory will lay open to the merchant.

The future awaiting the British manufacturer in China is believed to be bright, provided he is prepared to devote proper attention to the cultivation of the market. The results of Britain's trade with this vast market during last year showed a step towards improvement.

The arrival of Mr. W. M. Kirkpatrick, representative of the British Government Export Credits Guarantee Department, coincided happily with a period of the utmost cordiality in the relations between Britain and China. Although Mr. Kirkpatrick denied any connection between his appointment and a loan for China, or any political move, the mere fact that the British Government has considered it necessary to dispatch to China a special representative of Mr. Kirkpatrick's calibre has produced a bracing moral effect on the Chinese nation.

It is too early to predict what results Mr. Kirkpatrick will achieve, but it is felt generally that the facilities which the Export Credits Guarantee Department are prepared to grant to *bona fide* business is exactly what British trade in China requires to bolster it up and regain lost ground.

Heralding the arrival of Mr. Kirkpatrick, as it were, the last few months have registered some noticeable gains in certain British lines, chiefly in the heavy industries.

Two Major Contracts for British Heavy Industries

First evidence of closer Sino-British economic co-operation following the exchange of visits between the Governor of Hongkong, Sir Andrew Caldecott, and the Canton authorities, was shown on November 27 last, when two important Sino-British contracts were signed. The first contract, signed with Messrs. Malcolm & Company, calls for the construction of a water filtration plant to supply the city of Canton, while the second, made with the General Electric Company, calls for the delivery of 64 "Leyland" trolley buses. A sum of approximately Hongkong $2,800,000, included in which £81,000 has been allowed for the costs of machinery and special equipment, is involved in the first contract, while the cost of the buses is £200,000. The Mayor of Canton, Mr. Tseng Yang-fu, signed on behalf of the Canton authorities in both cases.

Negotiations in connection with these contracts had been going on with the previous administration (General Chen Chi-tang) for nearly two years, but it was not until after Mr. Tseng Yang-fu's assumption of office as mayor, last August, that the schemes were seriously proceeded with.

Electrical and Mechanical Plant

In the contract awarded to the General Electric Company, the Municipality of Canton agree to purchase the whole of the electrical and mechanical plant required for the first section of the trolley bus scheme, including 64 bus chassis complete with all electrical equipment, as well as compressed air braking equipment, over-head apparatus for 18½ miles of double track and for two car-sheds to hold 40 vehicles each, a number of sub-stations, 8½ miles of underground feeder cable and other equipment.

A notable feature of this contract is that the General Electric Company has agreed to give the Municipality credit extending over a period of six years, payments to consist of 24 equal quarterly sums and to include, from the fourth instalment, interest at the rate of six per cent per annum. The trolley project is a part of the program to improve the city's communications, which are at present in deplorable shape.

Improvement of the Canton Waterworks

In the case of the Malcolm contract, credit has also been extended to the Municipality for a period of six years, but amortization will be in monthly instalments, the outstanding amounts to bear interest at six per cent. As security, the Municipality undertakes to set aside and hypotecate such portions of the total surplus revenue after payment of maintenance charges only of both the old and the new waterworks as may be required to bear the interest charge and the amortization. The Municipality further undertakes to provide a guarantee from the Municipal Bank to make good on demand any deficit that may arise should the revenue referred to be inadequate to service the loan.

All technical and financial details thus having been settled, work will be started in the immediate future. The plant, as designed, will be the most modern in the East, will comprise a battery of twelve filters and will be capable of supplying 30,000,000 Imperial gallons a day of 24 hours of clear sterile water, thereby bringing Canton in line with any modern city.

Due to the increase of population and the expansion of the city limits, the municipal authorities for some years have been hard pressed to maintain an adequate supply of water. The widening of the streets and modernizing of the city have meant unavoidable delays in forming a definite program of expansion, but plans are now completed, any when the new plant is put into operation, the city will have overcome a longstanding desire on the part of the authorities to cope with the needs of China's most important southern city.

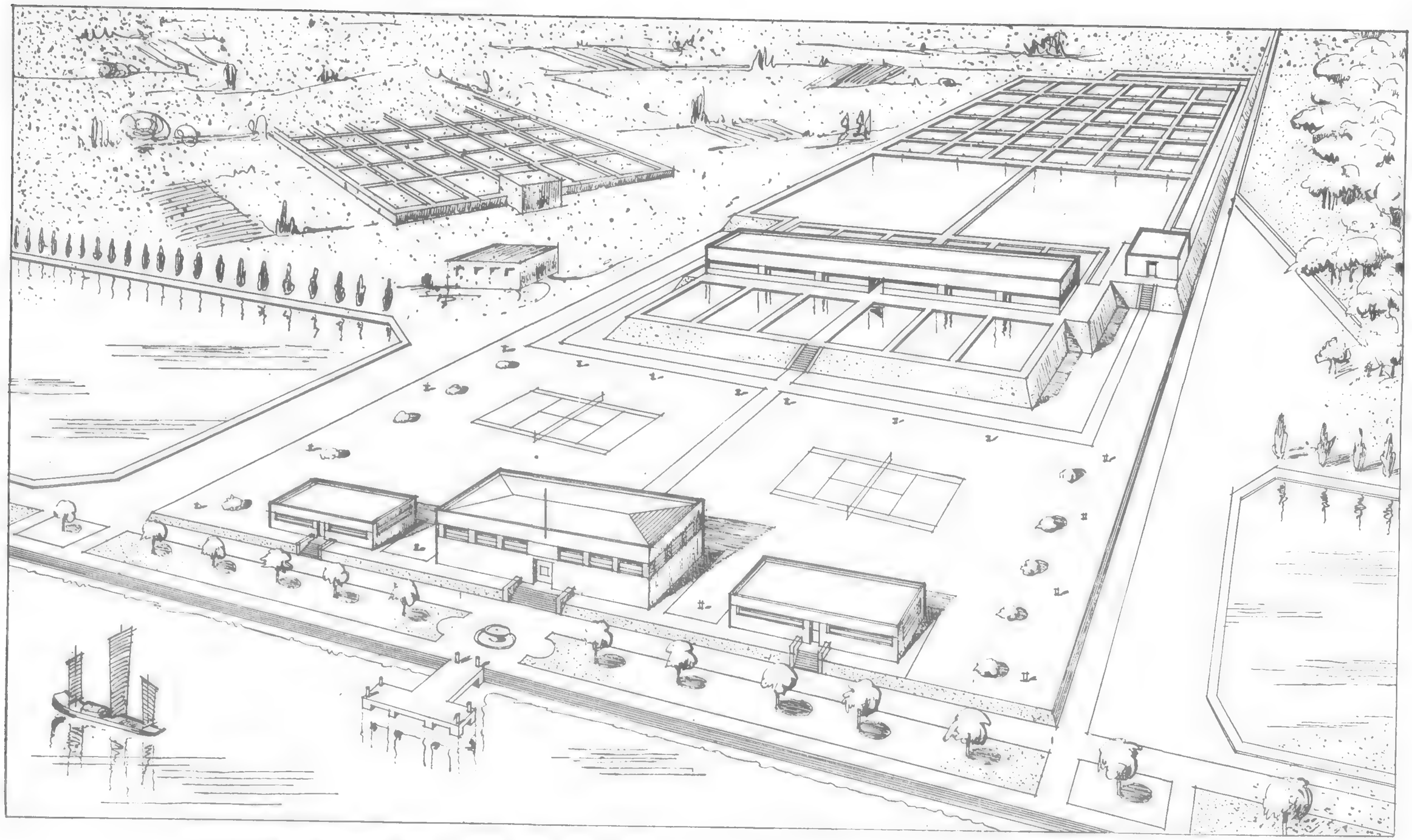
The site of the new filtration plant will be in the old waterworks compound, situated on the Pearl River. The new unit will be complete in every detail from pumping room with river source of supply to powerful pumping sets, continuous settling tanks, filters, adequate clear water storage to meet sudden excessive demands, and, in addition, a 3,500,000 Imperial gallon storage reservoir shall be erected within the city limits.

Canton is fortunate in being most favorably situated from a waterworks point-of-view. The city is built on comparatively flat land and at the same time possesses hills adjacent to the building center on which the large storage reservoir will be constructed.

The utmost use has been made of this hill in the scheme adopted by the engineers, so that a steady pressure and a large volume of water will be available to reach to the top of the high buildings in the city.

In less fortunate cities where comparatively small elevated storage can be arranged, innumerable pumping units must be provided to take care of the high and low demands for water, meaning increased initial cost of machinery and less economical operation. In the plant decided on there will be only three high pressure pumps delivering water to the city, and three low pressure pumps, drawing water from the river to supply the filters, and by this means a most economical pumping system will be obtained.

(Continued on page 186)



CANTON WATERWORKS—NEW WATER FILTRATION PLANT—30,000,000 IMP. GAL PER 24 HOURS

Designers and Contractors: Malcolm & Co., Ltd., Hongkong, Shanghai

The Port of Hongkong*

By Professor C. A. MIDDLETON SMITH, M.Sc., M.I.Mech.E. (Taikoo Professor of Engineering in the University of Hongkong)

(Continued from April, 1937)

THE Japanese O.S.K. Line have a new pier, recently reconstructed. It is 350-ft. long, costing $300,000. The Douglas Pier takes two vessels, 26-ft. draught. There is also the China Merchants' Pier and Jardine's Wharf (West Point) for three vessels of 23-ft. draught at L.W.O.S.T. There are some small piers alongside which river steamers and ferries berth. About 10 passenger-cargo river steamers come and go daily to the island, clearing from their berths every 24 hours. A recent great improvement has been the construction by the local Government on each side of the harbor of piers for vehicular ferries. These ferries enable cars, lorries, etc., to pass easily across the harbor.

At the East end of the island a recent reclamation, due to the enterprise of a Chinese Java sugar merchant, Mr. Kwick Djon Eng, has been completed. It provides a sea-wall (and wharfage) 1,800-ft. long, with a depth of water of 36-ft. The reclamation was originally planned in order to build a sugar factory, and bring ships with raw sugar, etc., alongside. The economic situation *re* sugar, due to new factories in Java, killed that project. A portion of the land and sea-wall has since been sold to the local Electricity Supply Company, who use it for the discharge of coal.

Wharves and "Godowns"

Nearly all of the large liners berth alongside piers on the mainland, where there is adjacent excellent accommodation for handling and storing cargo.

Three public warehouse companies have a storage capacity of 500,000 tons, of which 300,000 tons is on the mainland at Kowloon and 200,000 tons in Victoria, on Hongkong Island. There are many native-owned warehouses of small capacity in the Colony. Both of the groups of wharves at Kowloon Point have rail connection with the Kowloon-Canton Railway.

The Hongkong and Kowloon Wharf and Godown Co., Ltd., was formed in 1886, with an authorized capital of $1,700,000, for the purpose of amalgamating and working as one concern the undertaking known as Messrs. Jardine, Matheson and Co.'s Piers and Godowns, and the undertaking known as The Hongkong and Kowloon Wharf Godown and Cargo Boat Company. In the following year, 1887, the properties of the Peninsular and Oriental Steam Navigation Company were acquired.

The property obtained from Messrs. Jardine, Matheson and Co. consisted of:—At West Point (on mainland): One wharf and 100,000 sq. ft. of land with godowns with storage capacity of 50,000 tons of cargo. At Kowloon: Three wharves, and 414,000 sq. ft. of land with 1,620-ft. of harbor frontage and godowns of 65,000 tons capacity.

The property acquired from the P. & O. Company consisted of one wharf and 160,000 sq. ft. of land at West Point, and 40,000 sq. ft. of land at Kowloon.

The year following saw the acquisition of the foreshore in front of the Sailors' Home, adjoining the Company's property. The Company, therefore, carried out a similar reclamation on which godowns were built. The old property was then sold.

In 1889 the total storage capacity of the Company's godowns was for 115,000 tons. There were four wharves, the longest being 475-ft. At present (1936) the storage capacity is 400,000 tons. The berthing accommodation consists of six wharves up to 800-ft. in length, and the total area of property is 1,200,000 sq. ft.

During 1935, 1,020 steamers berthed at the wharves, and landed 818,733 tons of cargo. This was a record year for number of vessels to use the wharves. The year 1929, however, was the record for cargo landed, when it was over a million tons. The largest ship to berth during 1935 was the *Empress of Britain*, of 42,300 tons and 733-ft. in length.

It is of interest to note that on one day the following vessels were alongside the wharf:—

No. 1 Wharf:	*Kitano Maru*	7,952	tons.
	Empress of Japan	26,032	,,
,, 2 ,,	*Chichibu Maru*	17,498	,,
	Heiyo Maru	9,816	,,
,, 3 ,,	*Helmspey*	4,740	,,
	President Harrison	10,504	,,
,, 4 ,,	*General Lee*	4,611	,,
	Terukuni Maru	11,931	,,
,, 5 ,,	*Tilawa*	10,006	,,
	President Jackson	14,124	,,
		117,214	tons.

Floating craft comprises 10 launches and tugs and 105 lighters.

The authorized capital of the Company is now $8,000,000, and accommodation and equipment have kept pace with the rapid advance of sea-borne traffic.

It will be seen from these figures that since its inception the firm's business has advanced steadily and progressively, and the Hongkong and Kowloon Wharf and Godown Co., Ltd., can rightly claim to have played no small part in the development of the Port of Hongkong.

It is unfortunate that the Royal Navy have the victualling yard, camber, etc., adjacent, which makes it impossible to build more piers on a site near to those belonging to this Company; other plans have been suggested.

Messrs. Alfred Holt and Co., Ltd., have, on the Kowloon side their own berthing accommodation and godowns. Blue Funnel vessels from Europe or America are usually to be seen alongside their piers.

The wharves are equipped with travelling cranes, electric trucks, etc., and are specially designed to facilitate the rapid delivery of cargo immediately after discharge. Large transit sheds give protection to cargo during the period of free delivery.

View of the Channel with portion of Kowloon City (upper part of picture) and Buildings in City of Victoria (lower part of picture)

*The Dock and Harbor Authority

A large fleet of tugs and lighters is maintained for the conveyance of cargo at special rates to any points within harbor limits. Heavy weights can be readily handled, and provision is made for safeguarding valuable cargoes. The wharf at Hongkong is connected by a special siding with the Kowloon-Canton Railway, and cargo can be delivered direct to railway cars.

A special feature has been made of accommodation for prolonged storage of consignees' cargo. Particulars of capacity are given below. The warehouses are of steel and reinforced concrete design, equipped with electric light, elevators and an efficient fire-extinguishing apparatus, controlled in each case from a private power-house situated on the property. Special attention is given to ventilation and the prevention of damage by damp or vermin.

In Hongkong the wharf frontage is 1,600-ft.: wharf area 108,000 sq. ft.: storage accommodation—one 5-storey, four 4-storey, two 2-storey warehouses: floor area 260,000 sq. ft.: capacity 25,000 tons.

By special appointment of the Governor-in-Council, the Company's warehouses are constituted King's warehouses for the storage of dutiable goods and sugar.

Ample bunkering facilities are provided in Hongkong harbor from private stocks of coal of about 60,000 tons. About one-third of this is North China coal: the remainder comes from Japan and Formosa.

Oil fuel for commercial bunkering is available, the average stock being 55,000 tons. Delivery is from 600 tons an hour from wharf and 350 tons an hour from lighters. There are 13 water-boats, carrying water from Government reservoirs, each carrying from 200 to 270 tons. Considerable stocks of fuel, stores, etc., are kept by the Admiralty in Hongkong.

Three famous oil companies have large storage tanks in Hongkong for the supply of fuel oil to ships.

Naval Considerations

Although "shipping is the life blood of the Colony," the development of the port is affected by defence considerations. Commerce usually has to give way to the requirements of the Navy and Army. That, naturally, has caused difficulties at times almost of a personal nature. In the early days, when no one saw the possibilities of the great increase in the volume of mercantile shipping, the Royal Naval authorities built a dockyard in what is now the center of the City of Victoria. It occupies a valuable sea frontage. A considerable section of the stream adjacent to this dockyard is reserved for moorings for naval vessels. During the winter months Hongkong harbor accommodates the whole of the China fleet.

View of the Taikoo Dockyard showing Canadian Pacific s.s. "Empress of Canada" in the Dry Dock

Reclamation Schemes

Owing to the steep hillside on the North side of the island, the commercial section of the City of Victoria has been built on ground reclaimed from the sea. The first few acres had been filled in by 1856. In 1868 some 8½ acres were added, and more in 1874. In 1886, 23 and in 1896, 22 acres were reclaimed. In 1903 some 65 acres of the (now) western section of the city were filled in. In 1925-1928 about 100 acres were reclaimed at East Point.

Further East another reclamation, initiated by a Chinese but carried out by Government, reclaimed about 25 acres at a cost of about two million dollars, providing a quay wall 1,800-ft. long.

There have been very large reclamation schemes carried out on the mainland; that for the aerodrome, when completed, will total about 180 acres.

A recent reclamation at Shamsupo, used at present by the defence force, is about 60 acres.

The gross annual assessed rental of Hongkong and Kowloon in 1860 was $873,538; in 1917 it was $14,282,186; in 1934 it was $38,981,273.

Harbor Ferries

In addition to the frequent service of small steamers to Canton—100 miles up the river from Hongkong, and to Macao, 40 miles south by sea—there are numerous power-driven ferries plying in the harbor. The oldest is the service crossing direct from the island to Kowloon to the nearest point on the mainland opposite Victoria. It is managed by the "Star Ferry Company, Limited." The service has grown year by year, and since 1924 it has been necessary to build an entirely new fleet of six vessels, each with accommodation for over 500 passengers.

In the early days the ferries made 147 crossings a day and carried an average of 3,000 passengers a day. At the present time (1936) 278 trips are made, and approximately 28,000 persons travel daily.

The first ferry landing at Kowloon was at a jetty between the wharves belonging to the Hongkong and Kowloon Wharf and Godown Co. Later, the landing was moved to the site of present Public Pier site. This was built at right angles to the praya, which made it difficult for the ferries to get alongside owing to the strong cross tide running. It was also very exposed to winds in winter sweeping down Salisbury Road, there being no shelter or protection for passengers arriving and leaving by rickshas. The 1906 typhoon accounted for the wharf, and a new one was constructed in the same position.

In 1913 the terminus moved to the present position where a new wharf had been constructed. On the Hongkong side a new pier was built in 1911 on the original site.

Mention must be made of the Yaumati Ferry Co., Ltd., organized and managed entirely by local Chinese. This concern runs the vehicular ferries across the harbor, and two other ferry services to points on the mainland in British territory. In addition to the large number of vehicles ferried, the Company carries about 40 million passengers a year, i.e., about 100,000 a day.

Other local ferry services are managed by Chinese. The vessels are usually crowded; the fares are cheap, maintenance not very good, but the traffic seems to bring good returns.

The total number of passengers moving to and from Hongkong Island to the mainland, Canton, Macao, etc., in small steamers must be from about 150,000 to 200,000 a day.

There are about 500 steam launches, motor boats, etc., at work in the harbor, used for passengers and towing purposes. Sampans do a considerable amount of passenger transport.

Shipbuilding and Ship Repairing

In the early days of British trade with Canton, for about two centuries, until 1831, the East India Company held a monopoly

from the " home " Government. Their ships discharged and loaded cargo at Whampoa, about forty miles up the Canton River, into junks. It was therefore natural that efforts to effect any repairs were first made at Whampoa—in Chinese territory. There were, however, many difficulties, due to Chinese officials and local labor.

As Hongkong developed, efforts were made to establish ship-repairing facilities in the Colony.

There are now two large Dock Companies with dry docks capable of taking vessels up to 750-ft. on the blocks. The docks have a depth on the sills up to 34-ft. 6-ins. H.W.O.S.T. There are also five patent slipways capable of handling ships up to 325-ft. long and 3,000 tons displacement. A number of smaller yards, all but one being owned by Chinese, execute repairs for, and build, small craft.

The chief dock companies have splendid facilities for effecting extensive repairs and for the construction of ships of large tonnage. Their equipment compares favorably with similar establishments in Great Britain. Local wages for Asiatics are cheap, but a large European supervising staff is needed. All material used in construction and repair of ships is imported. Tugs and an up-to-date salvage plant are available.

The Hongkong and Whampoa Dock Co., Ltd., commenced its activities with the acquirement of the Mud Docks at Whampoa, in July, 1863. In October, 1865, it took over the Lamont and Hope Docks at Aberdeen on the South side of Hongkong Island, then the property of a Mr. John Lamont, and in October the following year the Company was registered under the Companies Ordinance in Hongkong.

In 1870 its scene of operations was extended to Kowloon, where it acquired a share in the property on which the now existing Nos. 2 and 3 Docks are situated. Further expansion took place at Kowloon in August, 1877, when two slipways were laid down, and in 1880 the Company bought the property now known as the Cosmopolitan Dock at Shum Shui Po, on the mainland.

To provide increased facilities for docking the ships of the British Navy, the construction of the present No. 1 Dock was commenced in 1882, and completed in 1888, making the Company at that time the largest British establishment of its kind outside the British Isles.

Sailing yacht "Tai Mo Shan" in No. 3 Dock, Hongkong and Whampoa Dock Co., Ltd. This vessel was built and designed in Hongkong and sailed across the Pacific, Panama Canal and Atlantic to England

There are now six dry docks, two slipways for docking and repairs, and building accommodation capable of laying down ten ships at one time, several of which could be 700-ft. long.

The Kowloon establishment has a sheltered sea frontage of 3,000-ft., with ample accommodation for berthing vessels alongside and mooring buoys at convenient distances from the jetties. The berth at East Yard has a depth of water of 40-ft., this berth being contiguous to the deepest part of the harbor, Lyemum Pass excepted.

Before the construction of the Admiralty Dock in H.M. Dockyard, the Hongkong and Whampoa Dock Co. docked all the vessels of the British Navy on the China Station, including the old ironclads such as H.M.S. *Iron Duke*, at Aberdeen, and later records show, amongst many others, H.M.S. *Terrible*, the flagship of the China Fleet. One of the largest jobs of the older days was the refit of H.M.S. *Glory* at Kowloon. Coming to the present day, we find the largest ship docked is the magnificent *Empress of Japan*.

The building yards already referred to are well equipped with all modern appliances and machinery for shipbuilding.

The total of vessels built now number 766, ranging from racing yachts and motor craft to passenger liners, standard war vessels, and tankers of 8,460 tons deadweight.

The workshops consist of engine, erecting and machine shops, boiler shop, forge and smithy, iron, brass and steel foundries, coppersmiths and plumbers: brass finishers, pattern making and electrical shops, sawmill and joiner shop, all of which are efficiently equipped with the most up-to-date tools and machines for work of every description.

A special note should be made regarding cast steel. The metallurgy of steel is the most complicated and highly technical of any branch of the science, and their products have so advanced in quality that the Dock Company is on Lloyd's list of approved makers of steel castings. A highly-trained steel metallurgist is employed, and the Company is equipped both with staff and plant for producing special steels.

Welding by electric or oxy-acetylene processes is also a feature of the Company's activities, and can be undertaken either in their shops or on ships, or elsewhere.

Diesel engine and turbine machinery, erection and repairs, receive the special attention of experts in such work. Twenty vessels for service in Philippine waters have been built and fitted with Diesel engines since 1926. In 1929 the entire engines were removed from the motor-ship *Raby Castle*, of 4,996 gross tons, for an extensive repair, and refitted again, the operation being practically repeated a short time ago.

The heaviest boiler built at Kowloon Docks weighed 78 tons.

The sawmill and joiner shops are well equipped for special features in woodwork. Part of the wood furnishings in the Hongkong Hotel, Gloucester Building and Peninsula Hotel testify to the high class of work turned out by this Company.

Salvage and fire-fighting work is also included within the scope of the Company's undertakings. The large ocean-going tug, *Henry Keswick*, is specially fitted for such work, and a very experienced salvage diver and special Chinese divers are kept ready for service at short notice.

Finally, a word on the staff. Around a nucleus of the older Europeans, whose names are household words in Hongkong, is built up a younger, active and keen generation who will, in the course of time, leave their marks as their fore-runners have done before them. Repairs are carried out with skill and expedition, and the designing and building of special craft, fire-floats, double enders, tugs as well as the larger coasters, liners and tankers, is looked after by men highly trained in their particular branches.

Thus led, the competent and industrious Chinese artisans turn out work which is a continual source of satisfaction to clients and pride to the Colony.

This old-established Company is one of the largest dry docking shipbuilding and ship repairing companies in the British Empire outside Britain itself, its ground covering a total area of 96.49 acres, of which the Kowloon establishment occupies 68 acres.

From this Company grew up most, if not all, of the other companies dotted over the Far East, and wherever one goes, Sandakan, Singapore, or nearer home, there will be found Chinese workmen who were trained by the Hongkong and Whampoa Dock Company before they migrated.

The Taikoo Dockyard and Engineering Company of Hongkong, Ltd., is probably the most important industrial concern in the

Colony. The dockyard is situated on the island. It is a thoroughly up-to-date and efficiently-equipped shipyard and engineering works.

The granite dry dock, constructed to British Admiralty requirements, has an extreme length of 787-ft. ; the length on blocks is 750-ft. ; the width at the coping is 120-ft. ; the width at entrance 93-ft. 4-ins. at the top and 89-ft. at the bottom ; the depth of water over the center of the sill at high water (ordinary spring tides) is 34-ft. 6-ins. To provide for smaller vessels there are three slipways, the largest of which can take steamers of up to 4,000 tons displacement.

The berthing quay wall is 3,200-ft. long, and for the greater part of its length there is a depth of water of 40-ft. The establishment is well provided with a system of railways, travelling cranes, overhead and stationary cranes, for transporting heavy material, the largest cranes having a lifting capacity of 100 tons.

The shipbuilding yard is complete with all modern plant ; vessels of all classes and sizes have been built, up to the s.s. *Rhexenor* —dimensions : 452-ft. by 58-ft. by 35-ft. 3-ins. (gross tonnage 8,030). The yard has a special staff of expert designers, and is in a position to undertake shipowners' requirements in a very wide range of craft.

The main workshops cover over six acres of ground, and comprise erecting shops, heavy and light machine shops, boiler shop, forge and smithy, iron and brass foundries, coppersmiths' shop, etc.

The machine shops are equipped with the latest type of machine tools for building and repairing engines up to the largest sizes ; there is also a complete equipment of machines and tools for building both " Parsons " and " Brown-Curtis " turbines, which the Company builds under special license from Messrs. Parsons.

Special features of the works are the iron and brass foundries. All work in these departments is under the care of a metallurgical chemist. In the iron foundry special high-grade heat resisting castings are produced, the Company being makers under licence of " Lanz Perlit " iron, which is a hard, easily machined, high tensile iron particularly suitable for the high temperatures and pressure met with in internal combustion and superheated steam machinery.

The boiler shop has a very complete plant for building marine and land boilers, up to the largest sizes ; and plates, up to 30-ft. long and 2-ins. thick, can be dealt with there. The Company has a large number of the most modern electric-welding plants, and undertakes extensive work by this process as well as by oxy-acetylene gas, either at their yard or on clients' ships or premises.

The Taikoo Dockyard are also special licensees to build Sulzer Diesel machinery in collaboration with the Patentees, and have special modern plant for dealing with building and repairs to Diesel machinery, and a staff with special experience in such work.

The Company possesses a powerful salvage tug with complete salvage gear, and expert salvers.

The Company undertake the overhauling of all types of vessels, and the rapid handling of repairs has been made a special feature.

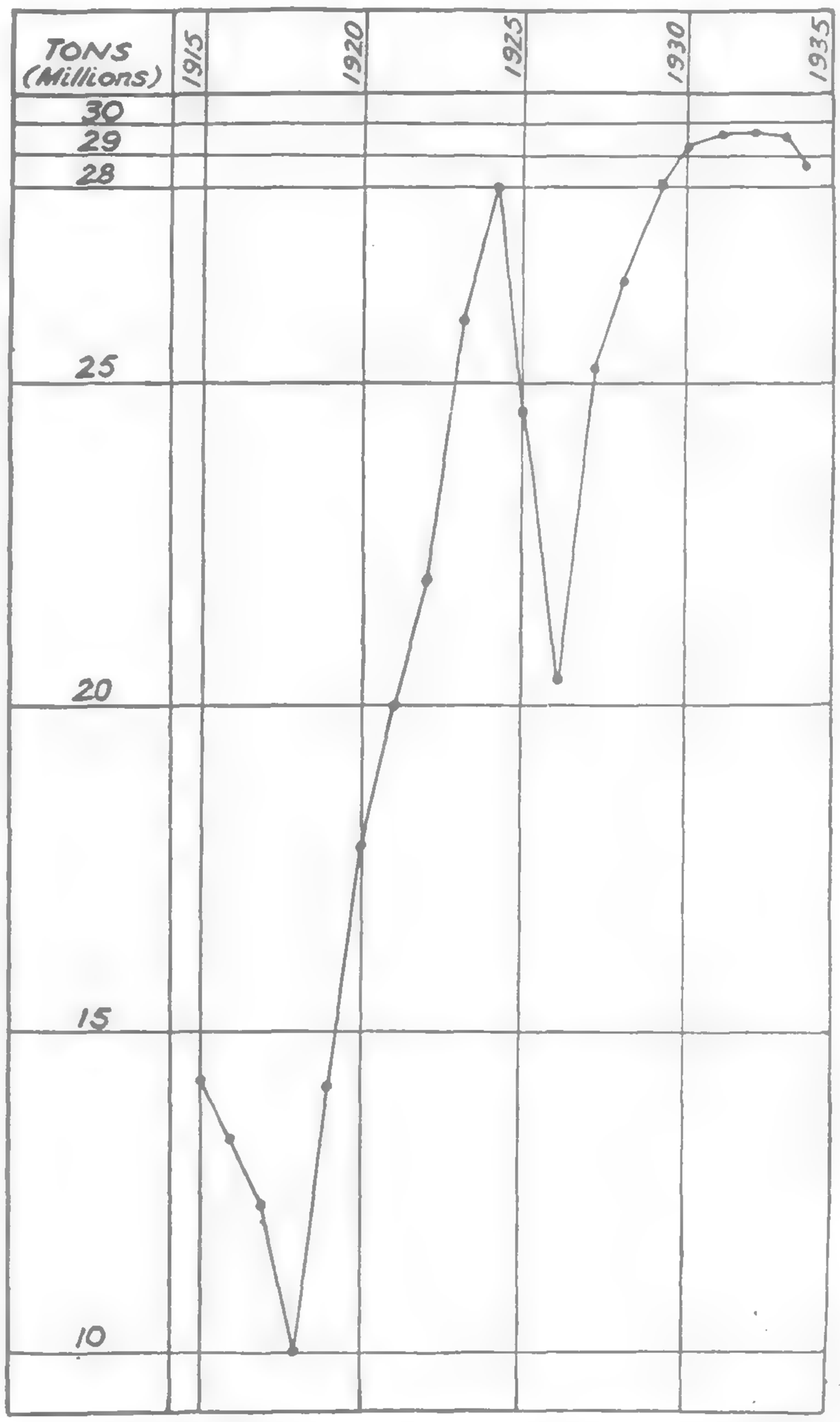


Diagram showing Ocean-going Shipping, British and Foreign, entered and cleared, 1915-34, in Hongkong

In common with the rest of the world, Hongkong has experienced, in recent years, disappointments in connection with shipbuilding. During the war, in the first seven months of 1917, four ships were launched from Hongkong slips, totalling 18,700 tons. The Blue Funnel *Autolucus*, built locally of imported steel, was 8,200 tons dead-weight. In these days China Coast vessels and small ships for river services, etc., are built, but the bulk of the work done in the local yards is in connection with ship repairs. It may be of interest to add that, since Hongkong is a terminal port for the trans-Pacific run, Japanese and American, as well as British liners, are refitted in Hongkong.

The firm of W. S. Bailey and Co., Ltd., Shipbuilders, Engineers, and Repairers, which has been established since 1900, has its office and works at To-Kwa-Wan, in Kowloon Bay.

Shipbuilding berths cover a sea frontage of about 550-ft., and on occasion no fewer than 21 vessels of various sizes were on the stocks over this frontage.

Ships up to 200-ft. in length can be built at this yard, and amongst the early successes of the Company can be mentioned *Kwong Sai* and *Kwong Tung*, two Canton to Hongkong steamers built in 1903, and still maintaining a daily service between these ports.

Of some 300 vessels completed, almost every type of craft is represented, ranging from passenger ships to sailing yachts, and including gun-boats, fast patrols for Police and Revenue Departments, tugs, cargo vessels, harbor launches, both luxury and utility, oil tankers, oil lighters, cargo lighters, bucket and grab dredgers, passenger ferries, and pontoons equipped for rock drilling, concreting, pile driving, etc., etc. Steel ships, wooden ships, motor ships and steam ships are all represented in the above list, and a competent European designing staff is employed, capable of dealing with any class of enquiry.

The shipyard is well equipped with the necessary machinery for handling this work.

The machinery in all departments is up to date, and the workmen are highly-skilled men working under European supervision.

Marine engines and boilers have been constructed for many of the ships built in the yard.

Forging of all descriptions, from crank shafts to eye-bolts, can be manufactured. Experienced fitters are employed for installation and assembly work of every kind. The foundry is capable of supplying castings of iron up to five tons and brass up to one ton.

Constructional work is also undertaken, and of the varied classes of work coming under this heading, Messrs. Bailey and Co. have had large experience in making and erecting steel buildings and godowns, wharves, roof trusses, bridges, derricks, oil tanks, mooring buoys, railway coaches, and motor buses and lorries.

For repair work, this yard is most up to date. The No. 1 Slipway has been entirely re-built and enlarged after 30 years' continuous service, and is now capable of slipping vessels up to 130-ft. in length, and 400 tons displacement.

No. 2 Slipway can take vessels up to 200 tons displacement, whilst No. 3 Slipway will accommodate ships up to 300-ft. in length and 3,000 tons displacement.

The fitting-out wharves are alongside the slipways, and have a depth of water of about 13-ft. at low tide. Ships anchoring in Hongkong harbor whilst undergoing repairs afloat are served by the Company's launch. Amongst the larger repair and reconditioning work carried out, the Douglas Company's steamer *Hai Ning* is an achievement of which Bailey and Co. can feel proud.

Shipping in Hongkong

For ninety years the P. & O. Company has continuously carried out the British Government Mail Contracts for the Far East. The mail service was extended to Shanghai in 1857, and to Japan in 1859. In 1857 the largest class of steamer in the service was that of the s.s. *Ottawa*, of 1,274 G.R., with 200 h.p. To-day the largest P. & O. ships on the China coast are as much as 17,000 tons register, and 15,000 h.p. In 1857, the 40 steamers, exclusive of transport, store and coal ships, totalled some 70,000 tons register and 18,000 h.p. The total tonnage of the fleets now forming one integral part of the P. & O. undertaking is no less than 1,800,000 tons. The P. & O. Company sent out the pioneer of ship repairing to Hongkong.

Messrs. Jardine, Matheson and Co. were running ships to China in 1857. They are general managers for the Indo-China S.N. Company. The red funnel steamers of this firm are to be seen in all of the ports of the Far East, from Teintsin to Manila, Samarang and Singapore, and westward as far as Calcutta. The firm of Jardine, Matheson and Co. have been for so long associated with the Far East that they may claim to be the senior British trading firm in China.

It was in 1891 that the Canadian Pacific Railway Company was organized, and almost immediately the enterprising management placed steamers on the Pacific. The well-known "Empress" boats have been running between Hongkong, Japan and Vancouver ever since. The blue riband of the Pacific is now in the hands of this firm, for the turbine-driven "Empress" steamers are the fastest ships on the Pacific Ocean.

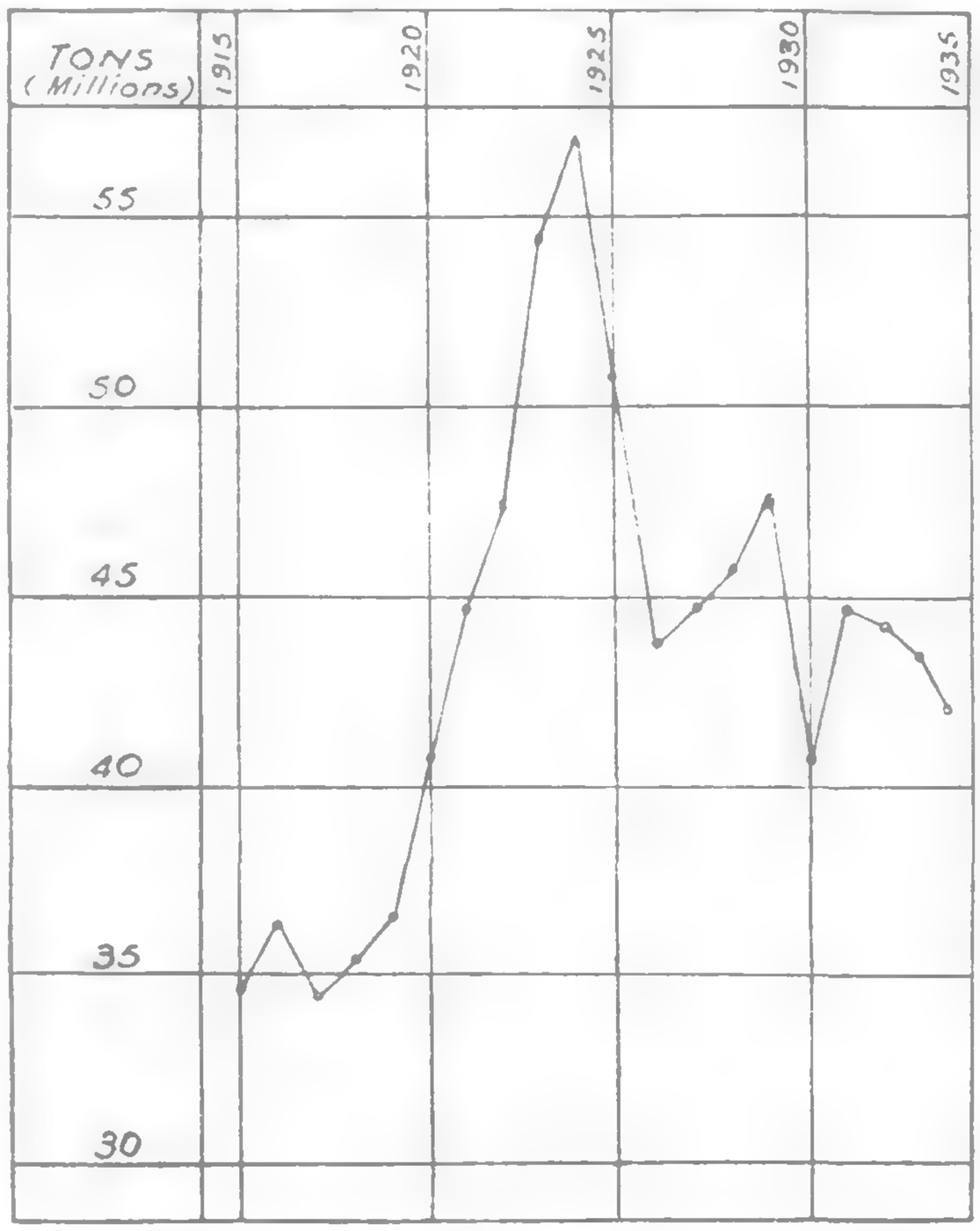


Diagram showing total shipping, all classes 1915-34, in Hongkong

The growth of the Japanese mercantile marine during the past forty years has had, of course, a marked influence on the shipping in Hongkong, and on the China Coast. The rapidity with which Japan has developed its trade in all directions is astonishing.

The Nippon Yusen Kaisha opened an office in Hongkong in 1893, when the Yokohama-Bombay Line, the first ocean service of the Company, was established. This well-known shipping company runs ships from Japan to London, and from Japan to Australia, to Vancouver, Seattle and New York. In 1935 the fleet consisted of 133 vessels of 770,000 tons. Many of these pass through Hongkong.

The Osaka Shosen Kaisha (O.S.K.) have ships calling at Hongkong, which run between Java and Japan, and Adelaide and Japan. They have also a Bombay line, a South American line and a service between this port and Victoria (B.C.), Seattle and Tacoma.

Sixty years ago there were many American sailing ships in Hongkong, but the first American steamer to commence a regular service was the *Colorado* (Pacific Main Co.) in 1867. Nowadays the "Dollar" and "President" vessels are frequently in Hongkong harbor.

French, German, Italian and Swedish lines for the Far East add considerably to the tonnage passing through Hongkong.

A Fair Field for all Nations

It is generally admitted in European commercial circles in the Far East that the trade of all nations has benefited immensely through the development of this port by British enterprise. The ships of all nations receive just the same facilities, and pay the same charges, as those that fly "the red duster." In the local dockyards Japanese, American, Dutch, Norwegian and Chinese-owned ships may be seen under repair. An American commercial publicist recently wrote as follows :—

"Hongkong is the greatest distributing port of the world for South China, as Shanghai is for North China. Owing to its strategic position as a commercial center, and a naval and military base, the international importance of Hongkong cannot be ignored. Its importance in relation to the Philippines will be realized more and more during the Philippine commonwealth period.

"The English have a saying : 'What we have we hold.' Unless the Philippines become a part of the British Empire it will not be surprising that, because of the British desires to hold and keep Hongkong to maintain its influence in the Far East, the United States will be persuaded by the British, and other European powers with possessions in the Far East, to remain indefinitely in the Philippines to preserve the *status quo* and balance of power."

Proposals for Port Development

A comprehensive scheme of new works recommended for construction was drawn up by the Port Engineer (Mr. Duncan) in 1924, but many of the items were very costly and have not been carried out. They are of interest, however, in showing what may be done at some future date.

It was considered that 17 additional berths would be required for the more economical handling of the import trade of the port, but it would be necessary to "hurry slowly" to make sure of satisfactory returns on the capital expenditure.

On the island site of the harbor it was proposed to develop the North Point foreshore for suitable berthage. Various objections have since been raised, and the scheme is unlikely to be carried out unless there is a big revival in the trade of the Colony.

A Rival Port to Hongkong

From time to time plans are suggested for the construction in China of a port as a rival to Hongkong. At present none of these plans have materialized. The latest scheme published (1936) is being considered by the Government of the neighboring Chinese Provinces of Kwangtung ; the Province is about the size of England and Wales.

In July, 1935, Mr. G. A. Van Steenbergen, C.E., was directed to study the conditions of Canton harbor. The financial and technical difficulties to be surmounted are by no means negligible, and will be discussed in a later contribution. Mr. Van Steenbergen has recommended extensive works.

The proposal is to make a deep-water port at Whampoa, on the Canton River, so as to link it up with the Canton-Hankow Railway.

The expense is estimated at about four million dollars (Hongkong currency), but that figure at the present rate of exchange is only about £250,000, and obviously is sufficient only for preliminary work. The difficulty of Chinese Provincial Governments financing any of these schemes is almost insuperable. In any case, it is unlikely that ocean-going liners would go out of their direct route instead of calling at Hongkong. Coasting steamers can reach Canton, so that a port at Whampoa would not attract them. The real inspiration of the proposals seems to be due to nationalistic feelings amongst those Chinese politicians who do not favor the possession of Hongkong by the British.

Mr. Van Steenbergen writes :—" In one respect Hongkong will always be superior to Canton, that is, as regards the fast passenger traffic. Passenger traffic all over the world is attracted to those places which project out from the land into the ocean. Such places are attracting the fast passenger traffic . . . . " The train journey from Canton to Kowloon takes three hours, as compared with eight hours by steamer.

Hongkong, as a free port, has an important advantage over Canton with a harbor within Customs barriers. This advantage is particularly valuable where labor costs are low.

Another important advantage is the well-developed banking and other commercial organizations in Hongkong. At present there is but little confidence in Canton currency.

On the whole, it may be said that, while it is to be hoped that great improvements will be made in the construction of modern harbor works in Canton, the prosperity of Hongkong as a port depends much more on political rivalries in the Far East than on any new harbor works in, or near, Canton.

The Air Port

No description of port development in Hongkong would be complete without a reference to the Air Port. In 1934 the total expenditure, excluding work undertaken by the Public Works Department (buildings, reclamations, etc.), and the salary of the Director of Air Services (who is the harbor-master) was $50,957. There were 1,951 flights of civil aircraft, 3,170 passengers being carried. The Far East Flying Training School has about 40 engineering students, mostly Chinese under instruction, and some Chinese flying students.

A weekly air mail service from Penang to Hongkong was inaugurated in March, 1936. Civil aviation is making progress in the Far East as elsewhere. Large hangars have been erected on the aerodrome (at Kai Tack) in Hongkong, where there is a slipway for hauling flying boats up to the repair shops. It cannot be doubted that, in the scheme of Imperial defence, fast flying boats would make a rapid passage from Singapore to Hongkong, and in emergency find the aerodrome of great value.

Policy and Administration

The control of shipping in the harbor is under the local Government. The harbor-master (the Honorable Commander G. F. Hole, R.N.) is a member of the Legislative Council.

All port development work is under the general supervision of the Director of Public Works, who is a member of the Executive and Legislative Councils. A sub-department of the P.W.D. is concerned solely with port development : the Engineer-in-Charge is Mr. Anderson, who is assisted by a staff of four European engineers and Asiatic assistants. Acknowledgment must be made for help and the courtesy given by Mr. Anderson, who replied to many enquiries addressed to him by the writer.

Mr. Duncan, in his 1924 Report, was emphatic that " a properly constituted Advisory Port Authority, Board, or Imperial Tribunal is the first need." The report of the Economic Resources Committee in 1920 had also recommended such an authority.

Mr. Duncan stated his reasons, which are well worth noting, although his recommendation for such an authority has not been carried out. Yet every one connected with the shipping industry must agree with his conclusions. He wrote as follows : " To enable the Government to appraise intelligently the needs of the port, the Board should study and observe traffic, and port conditions, and advise and make recommendations as to whether the results of these studies indicate the desirability of greater channel accommodation by deepening the fairways, the provision of berthage, increased storage space, road and railway transport facilities, bunkering, ship repair and dry-docking facilities ; change in the disposition of buoys, lights, etc. ; modification of the tariffs, or advise in any matters which concern the efficient working of the port."

He was of opinion that private companies could not be expected to meet the cost of development works necessary to secure true efficiency and economy in the handling of cargoes, as the return on the capital cost is subject to trade being handled over the works constructed. It must be remembered that the port facilities in Hongkong are not only in the service of the Colony but of South China, and of the many ports with which the commerce is interchanged.

The Harbor-master, the Port Engineer and other Government officials, would, of course, be members of any Board constituting the Port Authority, together with representatives of shipping interests.

Of course, private enterprise is to be encouraged, and should be required to provide the shed, cargo handling and all other facilities. But care should be taken in granting leases for the use of piers and wharves so that a lessee may not keep his wharf idle rather than permit its use by an actual or potential competitor. Nor should he be allowed to make such high charges as to drive business away from the port.

It seems desirable that the Government, which can always raise money for loans on better terms than companies, should provide the costly works and lease them out on reasonable terms. But the commercial people would use their energy and ability in the administration of all business matters connected with the shipping of the port.

It cannot be doubted that when the time is opportune, i.e., when existing leases fall (1949), a Port Authority will be constituted.

This completes the story of the development of this famous Far Eastern port in South China. It is always dangerous to prophecy about the future : it is absurd to make the attempt concerning the Far East where conflicting political ambitions of various nations cause so much discord and anxiety. We can only suggest that the great naval base recently created at Singapore, the increase in the fortifications of Hongkong, and the development of aerial navigation, makes it reasonable to suppose that the British Government have no intention of surrendering this outpost of Empire. But whatever the political future of Hongkong may be, its geographical position, and its wonderful harbor, gives it an almost unchallengeable future as the most important port in South China. It must always remain one of the largest ports in the world.

Trade Statistics for Hongkong

Until recent years there have been available no statistics concerning the trade of this Crown Colony. A reliable local authority has informed me of a curious fact. It is that the origin of the present system of compiling trade returns was a question in the House of Commons which caused the Secretary of State to make enquiries concerning some detail which could be obtained only from trade statistics. When he discovered that the figures were not available he gave instructions that returns of imports and exports were to be made each year. It is said that the system costs the Colony about $60,000 a year, but very few copies of the publication are purchased.

During the war period some returns were compiled because it was very little extra expense to do so. A close watch of imports and exports had to be made in those days to make sure that Hongkong was not in any way assisting Enemy Powers. Those merchants who supported the idea of statistics succeeded in persuading the local Government to continue the good work until, after a few years, the local Government discontinued it on account of the expense. This explanation is given so that it may be realized that the figures given are not of any great value for comparative purposes.

During 1935 the value of merchandise imported into Hongkong totalled $365 millions (local currency), according to the declarations made by merchants to the Statistical Department of the Government. That sum represents a decrease, in terms of local currency, of 12.2 and 27.1 per cent, as compared with 1934 and 1933. At the time of writing, there are no signs of any improvement in the returns for 1936.

It may be of interest to note the largest individual items of import during 1935. They were :—

Foodstuffs	$108.02 millions.	Metals	$32.78 millions.
Piece-goods	52.67 ,,	Chinese medicines	13.01 ,,
Oils and fats	33.97 ,,	Fuels	10.62 ,,

COMPARATIVE RETURNS FOR HONGKONG SHIPPING AND FREIGHT

Class of Vessels	1912 No.	1912 Tonnage	1913 No.	1913 Tonnage	1931 No.	1931 Tonnage	1932 No.	1932 Tonnage	1933 No.	1933 Tonnage	1934 No.	1934 Tonnage	1935 No.	1935 Tonnage
British Ocean Going ..	3,956	7,779,970	4,210	8,449,533	4,834	11,540,844	5,014	12,201,690	4,815	12,014,232	4,824	12,035,087	5,092	12,510,998
Foreign Ocean Going ..	4,367	8,592,320	4,679	9,272,635	7,014	17,905,301	6,475	17,067,383	6,641	17,354,645	6,253	16,870,439	6,802	18,195,573
British River Steamers	6,968	4,197,744	6,624	4,078,635	8,154	8,175,054	8,249	8,216,528	7,089	7,539,230	7,669	7,438,173	7,606	7,504,180
Foreign River Steamers	1,938	894,349	1,780	949,328	2,967	1,107,322	2,768	1,096,287	1,986	790,878	1,759	730,579	2,006	779,925
Steamships under 60 tons	3,981	150,612	4,574	189,003	7,211	204,366	7,294	197,757	7,972	203,636	6,547	167,038	6,101	158,638
Junks, Foreign Trade .	25,593	2,654,275	25,653	2,882,518	21,621	3,000,861	22,559	3,014,360	22,089	2,959,962	16,991	2,812,717	17,946	2,338,163
Total Foreign Trade ..	46,603	24,269,270	47,520	25,821,652	51,801	41,933,748	52,359	41,794,005	51,492	40,862,583	44,043	40,054,033	45,553	41,487,477
Steam Launches, Local Trade	411,990	10,609,404	416,438	10,720,604	22,638	743,781	23,348	766,180	22,982	770,289	21,360	727,900	21,601	759,884
Junks, Local Trade ..	30,056	1,856,475	26,270	1,200,726	32,823	1,472,492	28,408	1,264,721	34,148	1,410,509	28,351	1,132,089	27,501	1,226,618
Grand Total ..	488,649	36,735,149	490,228	37,742,982	107,262	44,150,021	104,115	43,824,906	108,622	43,043,381	93,754	41,914,022	94,655	43,473,979

Since most of the imports to Hongkong are destined for South China and adjacent markets, the above items are the largest individual exports.

Exports from Hongkong of South China produce and manufactures were well maintained in 1935. There were increases under many headings, including wolfram ore, bamboo ware, lard, firecrackers, canes and feathers.

The unfortunate decline in the value of tea and silk exported from China, articles that once were the most important exports, must be attributed to the political chaos in the country and to the more scientific methods and organization of industry in competing countries. It is, perhaps, needless to add, that the artificial silk industry has had an adverse effect on silk exports from China.

The following tables show the decline in the value of imports of textiles and woollens from the United Kingdom to Hongkong. The industrial progress in Japan and in Shanghai has been a big factor, and will probably not decline in progress. On the other hand, machinery, steel, etc., is more in demand.

Imports and Exports, 1923-1934, Hongkong

IMPORTS (In £'s and $'s millions)

1923	1924	1930	1931	1932	1933	1934
£62.0	72.1	29.6	38.5	41.0	33.9	31.7
$544.6	607.7	455.5	737.7	624.0	500.9	415.9

EXPORTS

1923	1924	1930	1931	1932	1933	1934
£61.4	63.6	23.2	28.9	31.0	27.4	24.8
$538.9	536.0	356.8	541.9	471.9	403.1	325.1

NOTE—Average rate of exchange: 1923 = 2s. 3½d. 1924 = 2s. 4½d. 1930 = 1s. 3½d. 1931 = 1s. 0¾d. 1932 = 1s. 3¾d. 1933 = 1s. 4½d. 1934 = 1s. 6 5/16d.

Hongkong Import Percentages

The shares of the import trade enjoyed by the more important exporting countries are given below :—

	1930 Per cent	1931 Per cent	1932 Per cent	1933 Per cent	1934 Per cent
China	26.6	26.9	27.2	31.0	35.2
Japan	12.3	9.3	3.4	5.0	8.8
N.E. Indies	10.2	10.9	9.9	7.8	8.3
U.K.	9.4	10.6	12.3	10.4	7.8
U.S.A.	7.2	7.8	7.4	6.2	7.1
Indo China	8.7	7.1	8.4	8.5	6.3
Siam	5.9	6.4	9.3	10.0	8.0
Germany	4.6	5.1	4.1	3.8	3.3
Malaya (British) ..	2.3	1.9	1.5	1.2	1.3
India	1.5	2.3	2.8	3.7	2.0
Australia	.7	.9	1.9	1.6	1.6
Belgium	1.3	2.0	2.0	1.7	1.2
Others..	9.3	8.8	9.8	9.1	9.1

Piece-Goods and Textiles

Imports totalled $66.6 millions, as compared with $75.1 millions, and exports $48.7 millions, as compared with $55.5 millions.

It will be seen from the table below that the United Kingdom share of the import trade steadily declined from 38.6 per cent in 1932, to 23.9 per cent in 1933, and 15.5 per cent in 1934, whilst Japan increased her share from 7.0 per cent to 9.3 per cent and 17.3 per cent respectively, and North China from 36.3 per cent to 47.3 per cent and 50.6 per cent respectively. China and Japan, therefore, accounted for 67.9 per cent of the total import trade.

IMPORTS (in $'s millions)

	1932 Per cent	1933 Per cent	1934 Per cent
United Kingdom	41.4 (38.6)	17.9 (23.9)	10.3 (15.5)
Japan	7.5 (7.0)	7.0 (9.3)	11.5 (17.3)
North China ..	39.0 (36.3)	35.5 (47.3)	33.7 (50.6)
Germany	3.4 (3.2)	2.0 (2.6)	0.9 (1.4)
Italy	1.3 (1.2)	1.5 (2.0)	1.5 (2.3)
France	0.4 (0.4)	0.3 (0.4)	0.2 (0.3)
All Other Countries	14.3 (13.3)	10.9 (14.5)	8.5 (12.6)

Hongkong Shipping and Freight

The general outlook, and recent financial results, concerning shipping in Far Eastern trade have been depressing to those connected with it. The freight market has been poor, and sugar, bean, coal and salt freights which, until recently, provided tramp steamers with employment when there were no rice cargoes to be had, have been either carried in liners or ceased to exist in recent times.

The table of shipping, and the freight of same, shows the heavy volume of tonnage that is available. But various adverse factors have made business in Hongkong very difficult. The internal political chaos and terrible natural calamities of huge floods on the Yellow and Yangtze Rivers, and the rapid increase of tariffs in China, have been the main causes of bad trade, in addition to the world trade depression.

It is hoped that the recent legislation that imposed a managed local currency in Hongkong will effect an improvement. It has helped in many cases to do so. For Hongkong—and China—a few months ago, for the first time, abandoned the silver currency to which they had been wedded since foreign trade began in the Far East. The silver buying policy of the U.S.A. practically forced that change of policy.

New Survey Requirements

If the Hongkong Government enforces the new scheme of re-conditioning and re-equipping "Existing Ships" with Hongkong Government passenger licences, to enable them to conform with the rules laid down by the Simla Conference for the Safety of Life at Sea, owners will be faced with a disquieting problem of expenditure. The adverse trading conditions of recent years—year after year—have taxed their financial resources to the extreme. Several steamers have been reconstructed to meet the new requirements, but at the time of writing some owners of other vessels are waiting to see if they will be compelled to reconstruct. If so, some of them state that they will be forced to sell their vessels.

A very big trade is done in carrying rice—of which great quantities are imported to China—from Indo-China to Hongkong. Shanghai owners have thrown extra steamers on to this market, at low rates which adversely affected Hongkong steamers. In one case charterers chose to lay up a time chartered steamer until her charter terminated, paying full hire to her owners.

Last month a Hongkong owner informed the writer that, owing to the low rate of the local dollar (about 1s. 3½d.), he had taken ships off the Far Eastern trade and sent them on more lucrative voyages in the Indian Ocean.

The transport of Chinese coolies to and from Malaya, Dutch East Indies, etc., and South China in past years was a flourishing business, but in recent years has slackened down.

Shippers of rice in 1935 paid Hongkong owners £950 a month for 4,700 tonners, £900 a month for 4,200 tonners, delivery at Bangkok and re-delivery at Singapore or Hongkong, on a time charter basis.

In June, 1935, several Chinese and British steamers returned to Shanghai in ballast after having waited in Hongkong for weeks without employment. Sixteen steamers of all sizes, with a total dead-weight of 55,100 tons, were in Hongkong harbor at the end of June, 1935. But by the end of October, 1935, the unemployed tonnage was reduced to a single Chinese steamer of 2,300 tons dead-weight.

Incidentally, it may be mentioned that a portion of the Boxer indemnity funds, remitted to China by the British Government, was spent on purchasing new steamers owned by the Chinese Government. The British taxpayers, it may be remembered, presented the Chinese Government with a sum totalling £11 million sterling a few years ago. The general condition was that the money was to be spent on education, railways and industrial plant for China. All expenditure on materials imported to China (purchased out of Boxer funds) was to be in Britain. The new Chinese-owned ships were, it is true, built in Britain, but they compete with British-owned ships in the Far East. Many British owners feel that the money should have been used for other purposes, such as railway materials.

Aerodrome Lighting Equipment Developments

CONSIDERABLE research has been taking place for many months past with regard to Aerodrome Lighting Equipment, and recent developments of apparatus for this purpose by The General Electric Co., Ltd., for use on home and overseas aerodromes are of interest. These are linked up primarily with the making of all aerodromes safer for night flying, and for providing route direction beacons between one airport and another.

The equipment comprises beacons, floodlights, boundary and obstruction lights, wind directional indicators and control tower equipment.

Among the important aerodromes in this country equipped with G.E.C. Aerodrome Lighting Equipment during the past year are those at Gatwick, Gravesend, Leicester, Rochester, and Jersey, while overseas aerodromes have been equipped at Hongkong, Penang, Salisbury (Rhodesia), Singapore, Basrah, etc.

At Salisbury (Rhodesia) aerodrome, four 9-kw. 9-lamp aerodrome landing floodlights have been installed, which are capable of being rotated by remote electrical control from the control tower. The floodlight units are each rotated by a 3-h.p. motor which is coupled to the floodlight through gearing and drives it at a speed of 2 r.p.m. This slow speed is necessary so that the unit may be rotated through an angle of a few degrees. Limit switches are provided at each end of the 180° travel of each floodlight.

A recent addition to the range of G.E.C. aerodrome lighting equipment is a 24-in. diameter rotating route beacon. This is a searchlight type of beacon employing a 24-in. optically-worked parabolic reflector throwing a narrow angle beam just over the horizontal plane, and an auxiliary beam up to 25° above the horizon. In addition, the beacon is mounted on trunnions so that the angle of the beam can be adjusted to suit local conditions. It is driven by a ¼ h.p. motor and the light source is a 1,500 watt Class A.1. Osram projector lamp fitted with a pre-focus cap, so that lamp replacements can be effected without the need for refocussing the optical system. A standby lamp is also provided which automatically comes into operation in the event of the service lamp failing while the beacon is alight, and at the same time a warning bell and lamp are actuated alongside the beacon to indicate to the maintenance staff that a lamp has failed. Beacons of this type are being supplied to the Australian Government.

At Singapore and Jersey aerodromes, 6-kw. 6-lamp aerodrome landing floodlights are being installed. These floodlights are fitted with weatherproof housings, sufficiently large to allow an operator to enter and carry out maintenance work. The housings are built up of moulded sections of an asbestos material, bolted together and sealed between the joints with a special cement. They are cylindrical in shape and are covered by a conical roof on which is mounted an obstruction light. In the case of the units for Singapore, where tropical heat is experienced, exhaust fans are fitted to assist ventilation.

Large Chinese Orders for Britain

(Continued from page 177-178)

Special care has been given to the mechanical apparatus controlling the filters, and little, or nothing, has been left to manual control. Automatic gear of the most modern design will be provided for, and all twelve filters will be controlled and manipulated from one central master control table.

Independent control of each filter will also be obtained as desired, and automatic indicating apparatus shows the attendant the continous performance of each unit. In addition to reading, at sight, the condition of each filter while in operation, the amount of water passing will be indicated on a chart kept for reference and for the maintenance of official records.

These charts make a true record during every 24 hours of the day, each day having its own chart: thereby indicating to the officials in charge the exact amount of water passing at any period of the day. By this means the condition of the filter bed may be charted and adjustments made accordingly.

Particular attention has been paid to sterilizing the water, passing from the pumping station into the city. Special apparatus, similar to that used in all modern waterworks will be installed to control the chlorine gas, which is mixed with the water in small quantities but sufficient to kill all harmful bacteria. Duplicate sets will be provided to ensure a constant supply, in case one plant is stopped for repairs.

In addition to the equipment described above, a 42 inch diameter supply main will be laid direct from the new filtration plant to the hill reservoir. This main will be connected to the piping system now in use in the city, and at the same time will adjust the storage of water in the reservoir and maintain a steady pressure when excessive demands are made by water consumers.

It is learned that the structural designs are now well advanced. As Messrs. Malcolm & Company have, within the last few months, completed an important water filtration contract for the Macao Waterworks Co., all plant required for the erection of this new project will be available for immediate use.

The whole of the work will be carried out in the short space of one year, thereby ensuring an adequate supply of water before the summer of 1938.

Railway Materials

Following shortly after the announcement of the above-mentioned contracts, news was released on December 2 last, that an agreement involving the purchase by China of £900,000 (Chinese $15,000,000 approximately) worth of British railway material had been initialled by Messrs. Jardine, Matheson & Co., Ltd., and the Nanking Ministry of Railways.

The material covered by this agreement will be used to equip the new Kingkan line, which is to connect Nanking with the Canton-Hankow Railway.

The transaction is being financed jointly by the Hongkong and Shanghai Banking Corporation and the British Boxer Indemnity Trustees, and the whole equipment will be purchased through Jardine, Matheson & Co., Ltd.

On top of all this came the announcement that the contract signed between Messrs. H. H. Brassert & Co., of London, and the former Kwangtung Provincial Administration (under General Chen Chi-tang) had been made valid by the Nanking Ministries of Industries. This particular agreement covered the construction of a large iron and steel plant and involved the large figure of 20,000,000 Chinese dollars.

The terms of the original agreement called for the construction of the plant at Tung Long, four miles from Canton on the right bank of the Pearl River; but the Central authorities, after their assertion of authority over the former Kwangtung regime, considered that Tung Long, while being a convenient location from the point of view of transport, is vulnerable from the angle of national defence. The exact site will shortly be decided upon, as the Nanking Government realize that China cannot keep on depending on imported iron and steel for her factories and arsenals. It is also understood that Messrs. Brassert & Co., are also prepared to extend credit facilities for this project.

The signing of these important contracts is a step further in the direction of Sino-British co-operation. Finance—as outlined above—has been derived almost entirely from British sources in Hongkong, and with this close friendship between the two major cities in south China, a firmer understanding is expected to materialize.

Rolling Stock for Chinese Railways

British All-Steel Cars Delivered

The Far Eastern Review reported recently in its Engineering Notes that a number of all-steel coaches, purchased in Great Britain, had been landed at Lienyun Harbor and sent forward by Lunghai Railway to Chengchow thence to be forwarded over the Ping-han Line to Hankow for delivery to the Canton-Hankow Railway. Below is given a detailed description, from Modern Transport of the coaches in question.

RAPID progress is being made towards the completion of thirty-four all-steel coaches which the Birmingham Railway Carriage and Wagon Co., Limited, of Smethwick, are constructing for the Canton-Hankow section of the Chinese National Railways, nineteen of the vehicles having already been shipped, and work on the remainder being well in hand. The coaches—the order for which was placed by the Chinese Government Purchasing Commission—are being constructed under the supervision of Messrs. Sandberg, consulting and inspecting engineers, of 40 Grosvenor Gardens, S.W.1, and comprise third class sleeping cars (4), second class day cars (5), baggage and guards' vans (5), baggage and mail vans (5), first class dining cars (5), first class sleeping cars (5), and second class sleeping cars (5).

The sleeping cars and day cars are of the vestibule type and have a length over vestibule end-plates of 74-ft. 6⅛-in., a length over vestibule end-pillars of 72-ft. 5-in., a length over body end-posts of 56-ft. 10½-in., and a length between bogie centers of 51-ft. 10-in. The baggage and guards' and baggage and mail vans and the dining cars are of the non-vestibule type, and have a length over gangway face plates of 68-ft. 11⅝-in., a length over body end-posts of 66-ft. 7⅝-in., and a length between bogie centers of 48-ft. 6⅝-in. The following leading dimensions are common to all cars :—

Width over bodyside panels	10-ft. 1¼-in.
Width over roof	10-ft. 5⅛-in.
Height of rail to center of coupler ..	3-ft. 6⅛-in.
Bogie wheelbase	8-ft.
Journals	10-in. by 5½-in.
Centers of journals	6-ft. 5-in.
Diameter of wheels on tread	3-ft. 3⅜-in.

Underframe and Bogies

The underframes are constructed of mild steel rolled sections, plates and pressings, the headstocks being made up of channels and fabricated members to accommodate the buffing and draw-gear and to receive the main end-framing joints. "Pitt" type couplers, with a stem centering device, and "Bradford" draft gear, with the "Farlow" two key attachment, are provided for, one set only being supplied. The remaining sets are being fitted abroad. Westinghouse air brakes are fitted, with suitable size cylinders for each type of car, whilst hand-brakes are also provided, these, in the case of the vestibule cars, being of the ratchet type operated from the vestibule. The handbrakes of the non-vestibule cars are operated by means of hand-wheels.

Each car is mounted on four-wheel bogies of the equalizing beam type. The bogie frame is constructed of rolled steel sections and plates, strongly kneed and riveted together, and axle-boxes of "Isothermos" type are provided. The bolsters are mounted on quintuple type elliptical springs with swing link suspension from the cross-bars, and the loads are transmitted to triple helical side springs mounted on the equalizing beams. The wheels are of the solid rolled type.

Structural Equipment

All cars are fitted with metal diaphragms having laminated springs at the top and helical springs fitted to plungers in the underframe below. The vestibule cars are fitted with spring-hinged flap doors with automatic locks, fitted over the vestibule steps to form a complete floor when the vestibule side doors are closed. The gangways are provided with spring roller curtains with special handle fasteners which automatically release in the event of the coaches being uncoupled whilst the curtains are still connected. Hinged pantograph tailgates are fitted on the vestibute cars only, the non-vestibule stock having body end-doors.

The floors, except those of the baggage and guards' and baggage and mail vans, are made of galvanized dovetail steel sheets and are riveted to the underframe and overlaid with fireproof flooring material. The floors of the baggage and guards' and baggage and mail vans are of galvanized steel sheets riveted to the underframe and overlaid with timber stringers and a double layer of timber boards, the baggage compartments in each case being also provided with floor slats. The lavatories of these particular cars are provided with galvanized dovetail sheets and fireproof flooring as for the other cars. The first class sleeping cars and the saloon, corridor and cashier's rooms of the dining car are carpeted, whilst the floors of the kitchen and pantry of the dining cars are fitted with maple slat floors arranged in frames for easy removal. All cars are fitted with "Alpax" metal window frames and with "Beclawat" type lifting light frames complete with spring balance gear and sliding in silent channel runs. Similarly, all cars are fitted with ventilators of the "Airvac" type, fitted in the ceilings, and are provided with "hit-and-miss" regulators. Heating is effected by means of "Vapor" type equipment supplied by Gresham and Craven, Limited, and J. Stone and Company's electric lighting and fan equipment is provided in all cars.

Interior Arrangement

Each third class sleeping car is divided into nine open compartments, eight compartments having accommodation for eight passengers and one compartment having accommodation for five passengers, the berths being so arranged as to collapse and form a day car when necessary, in which case the extreme upper berth forms a luggage rack for day use. Each second class day car has one main saloon with two men's lavatories at one end and a women's lavatory and a locker at the other end. The saloon compartment has accommodation for 82 passengers and is fitted with 19 double seats, each seating four passengers, and three single seats, each seating two passengers, arranged on each side of the car with a central gangway. Each seat is made up with a polished teak end, well-sprung seats and backs covered with "Rexine." Small tables with aluminium angle edges painted to match the interior of the car, and with the tops covered in "Rexine," are arranged on the bodyside of the main compartment and are removable.

Each baggage and guard's van is divided up into one main baggage compartment with lavatory at one end, and a guard compartment and a train men's room at the opposite end, with a corridor the whole length of the van on the one side. Access to the baggage compartment is by means of sliding doors from each side of the van, the corridor partition being provided with a sliding door exactly opposite to the body side sliding doors. The guard's compartment is provided with two berths covered with "Rexine," the upper berth arranged to hinge down to form a seat back for day use. A table is provided, above which is arranged a cupboard. Entrance to the guard's compartment is by means of a steel sliding door from the corridor. The train men's room is arranged at the end of the van, adjacent to the guard's compartment, and has bodyside entrance doors on both sides of the car in addition to access from the corridor. A bench is provided transversely, and fixed to the guard's compartment partition, and a folding seat is fixed to the bodyside at the corridor side of the compartment. Steel tool boxes are fitted in each body-end corner of the compartment. The baggage and mail vans consist of a baggage compartment at one end, an office in the center, a lavatory at the opposite end, and a mail compartment between the office and lavatory, a corridor being arranged along the whole length of the van on the one side similar to the baggage and guard's van. The office compartment is provided with two berths, well sprung and upholstered in "Rexine," with the upper berth arranged to hinge down and form a seat-back for day use. The mail compartment is

(Continued on page 207)

The "Kofler" Automatic Train Blocking System

Out of Austria, it appears, has come a device for which railway men all over the world have been waiting. This device is the invention of Mr. George Kofler, and its purpose is to prevent automatically disasters and wrecks which otherwise would be inevitable after trains have passed safety blocks.

The specialist in railway safety appliances is aware that on occasions not to be avoided, and in view of general technical development, existing signals will not be adequate unless it is possible to reduce, to a minimum, the responsibility of the engine driver for the observation of signals. The hazard which, year after year, causes inevitable railway accidents can be eliminated it is believed, by reliable automatic transmission to the running train of the signals.

It is impossible to enumerate here all experiments which engineers have made in long years of painstaking work to master this problem, so simple in principle. It is an old axiom in engineering that simple things are attained via complicated things. Thus, with regard to fundamental design, electro-magnetic systems or contact making ramps, such as those used by the Japanese railways, are excellent. But looking at the Japanese State Railways disaster record gives proof of the fact that half a dozen of accidental causes are sufficient to entail serious disaster. It is evident that subsequent investigations do not result in stating the actual failure of the signals. It is just that "various circumstances" which, for want of clearness, can no more be discerned have been the cause of accidents.

A side-view of the "Kofler" automatic train blocking system, built in the existing signalling device

Permanent way and vehicles have attained a stage which allows the railway successfully to compete with aero planes and automobiles. Besides, the railway can always claim to offer more comfort and greater independence of atmospheric conditions. But, there should be a fair average safety.

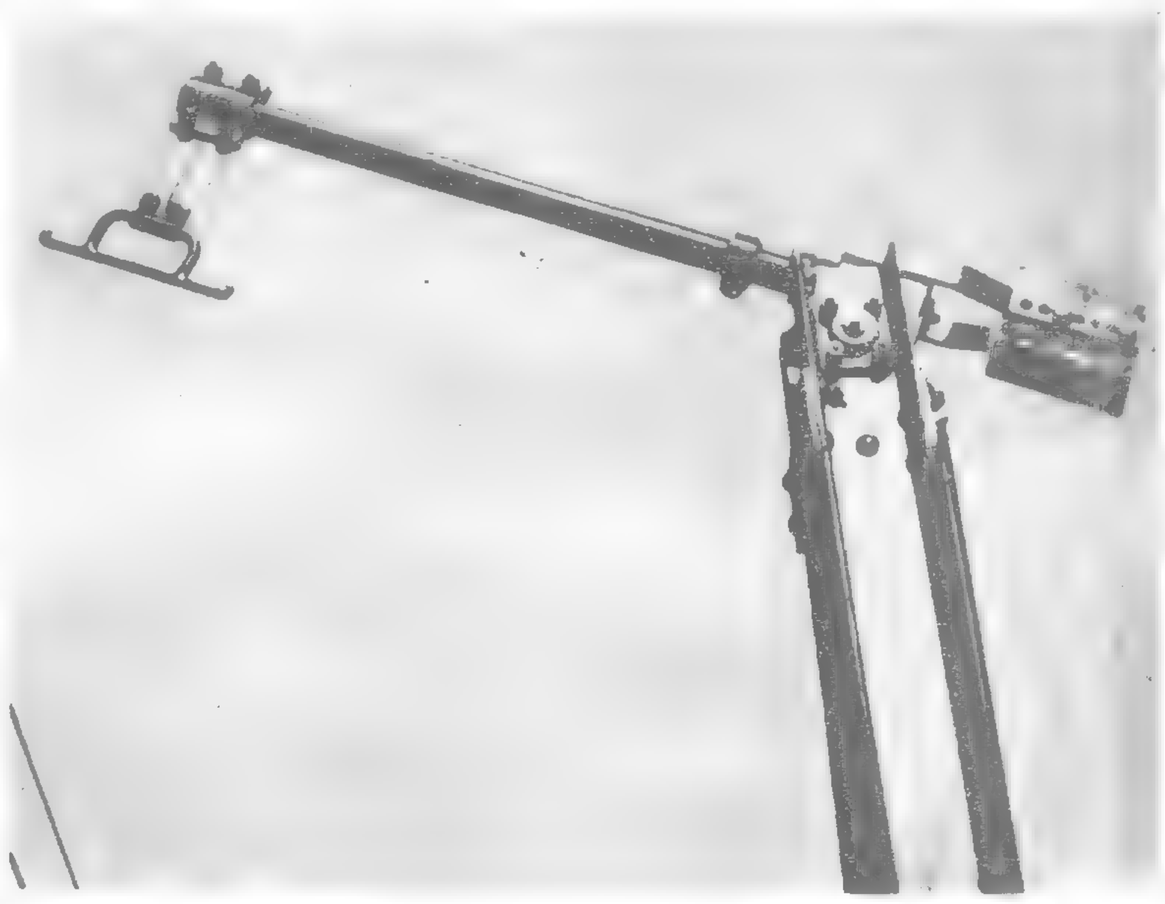
For instance, terrible accidents on the newly completed Canton-Hankow Railway made headlines at the end of last and beginning of this year. According to reports of one of these fatalities, a mixed train of 24 cars proceeding northward was forced to stop near Taping-lee, when the load proved too heavy for the two engines to pull up a grade. The train then was cut into two sections, the first part proceeding up the grade. Strict instructions had been given the engineer of the second section not to move until he saw the sign the track was clear. The 12 coach load, however, apparently proved too heavy for the engine of the first section and the engineer was forced to leave four cars on a slope intending to pick them up later.

Meantime, the second section, believing the track to be clear began moving upgrade, the four cars, apparently jarred loose by the vibration, came rushing downhill and piled headlong on to the engine.

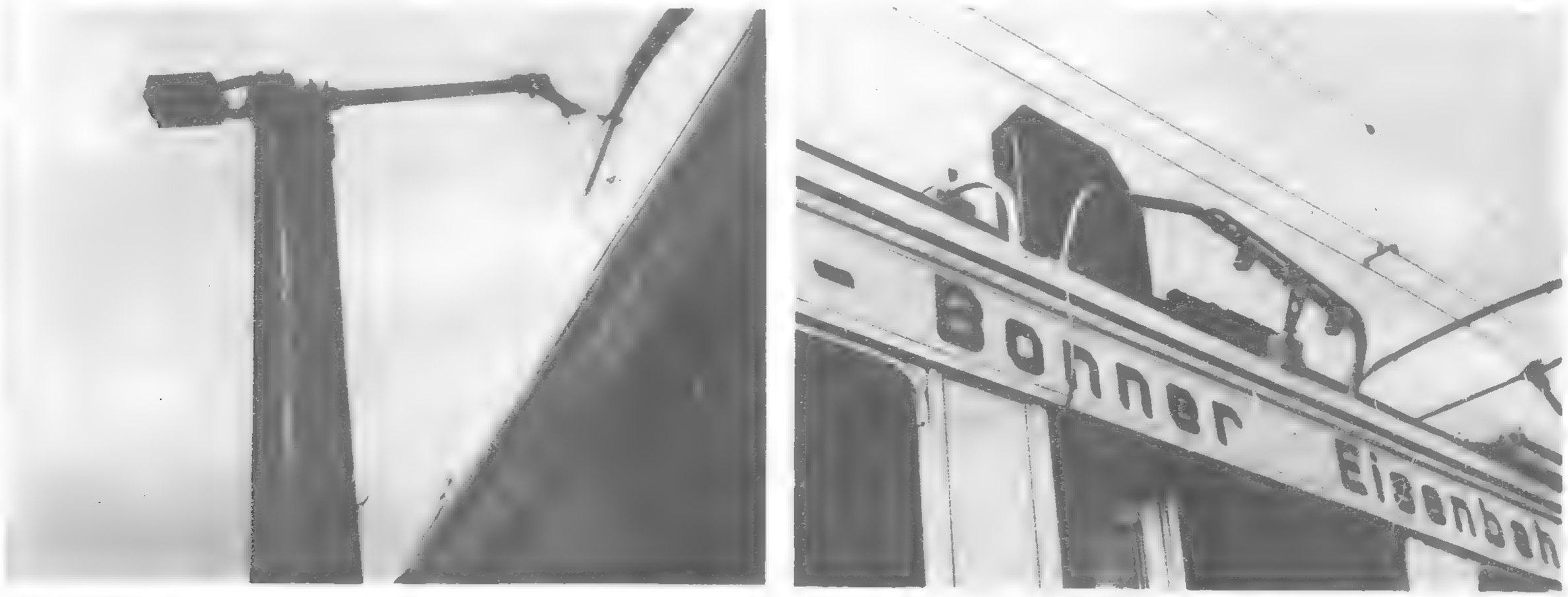
The Canton-Hankow Railway construction had been pushed to completion with feverish efforts which included the introduction of nightwork, and the resort to temporary structures where the permanent ones would entail greater length of time. So, the completion of the line did not mean that the line, as a whole, was ready and fit for normal traffic. In the haste to have the track linked up, thoroughness had to be sacrificed for speed. Besides, the facilities of the railway had been stretched to almost breaking point by the necessity to move more than 500,000 men northward from Kwangtung following the Kwangsi situation. Even so, some of the accidents might have been avoided had there been a reliable safety appliance.

It is foreseen that railways in other countries will undergo the same experience with the electro-magnetic train blocking system as have already occurred on a number of American railways. The electro-magnetic system is a product of the laboratory and has proved useful on shorter lines, thanks to careful operation by reliable, trustworthy staffs. However, when the electro-magnetic block system is applied to long distances, it is found that complete dependability cannot be ensured. Here appear influences which, in America as elsewhere, definitely could

General view of a line, equipped with the "Kofler" safety device



"Kofler" apparatus, as in service on the Italian Nord-Milan Railway

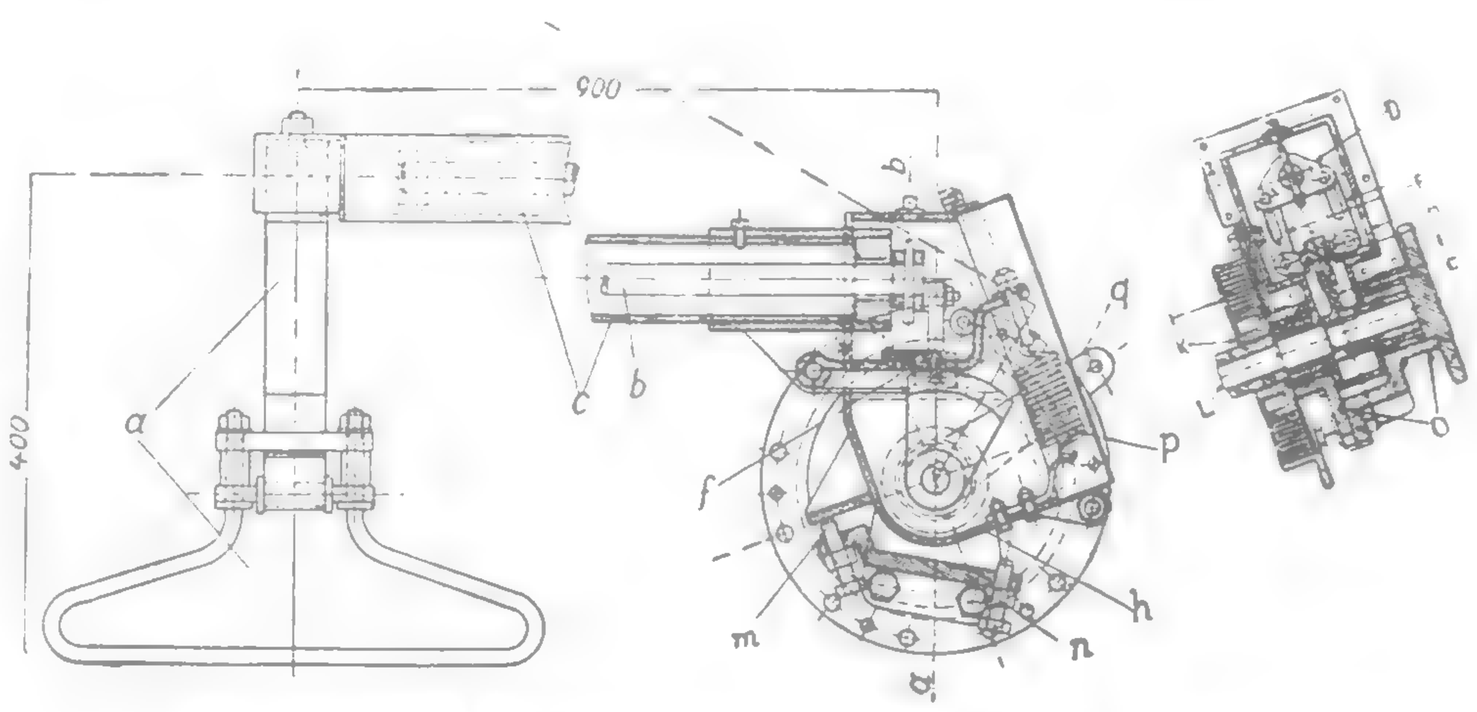


The "Kofler" automatic train blocking and signalling system, invented and designed by Engineer Kofler, is above shown operating on the Cologne-Bonn Line. Note the device projecting sideways on the roof of the electric coach

not be ascertained after long years' service. There is only one thing that has clearly and painfully been felt, namely, that the installation of electro-magnetic signalling was very expensive and the upkeep did not pay in the long run. Repair and upkeep are no doubt necessary, but these costs impose many drains on railway companies; but not for railway companies which have permanently to pay. On the other hand, it is not feasible to refute such facts by the statement that defects, if any, can be remedied after a few years' service. A bridge thrown over a broad river must be designed in such a manner as to stand from the outset every possible load by traffic. A reference to subsequent improvements would not be considered by the bridge-builder. A building that is correctly designed and schemed is from the beginning good and will remain so.

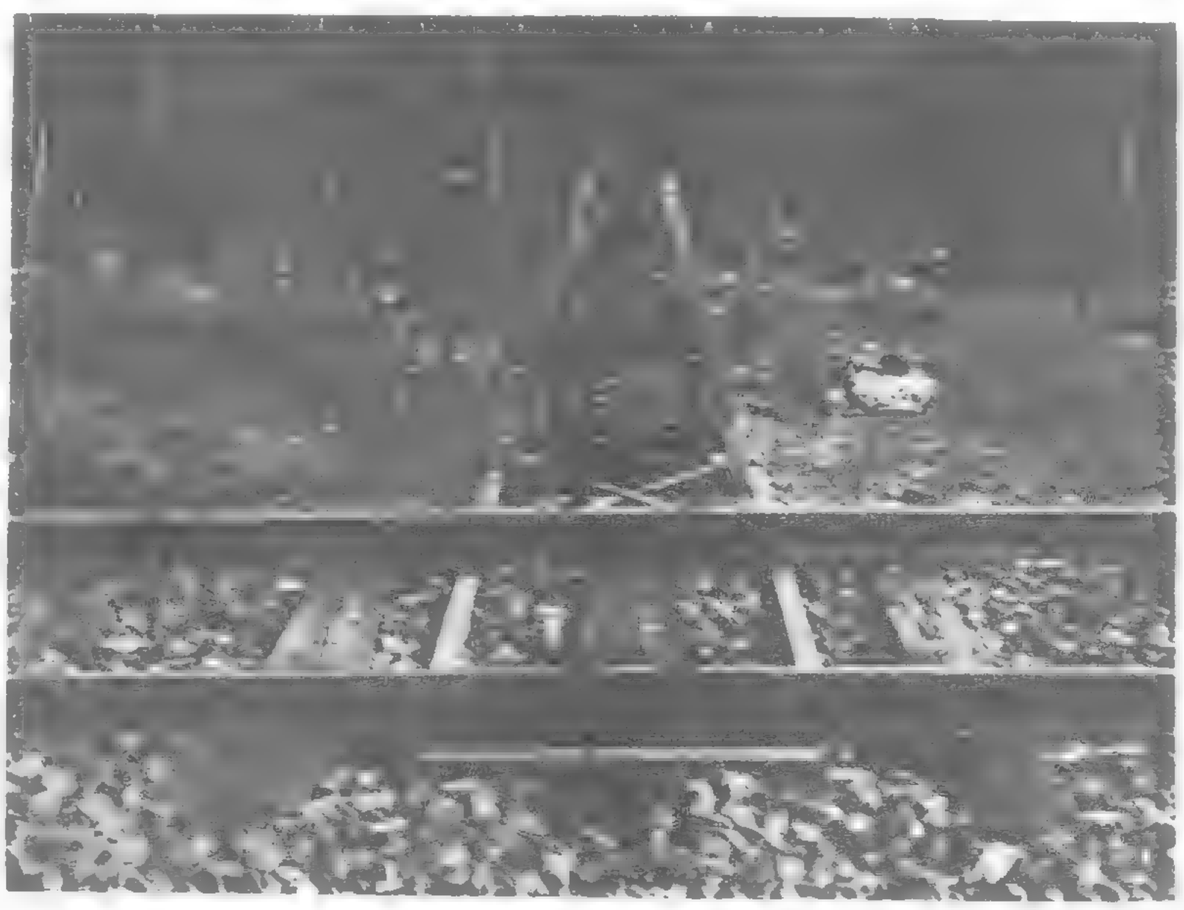
One has, therefore, to urge a general introduction by railway companies of a signal transmission on a purely mechanical basis. German and Austrian engineers have all along been in the forefront of research into railway safety devices. Claims to have definitely solved the problem have now been made by an Austrian engineer, Mr. George Kofler. His apparatus, known as the "Kofler" Automatic Train Blocking System, is simple in construction.

Numerous tests have been made of the invention of the engineer Kofler and the apparatus, it is reported, functioned perfectly at train speeds varying between 90 and 100 km. and has never failed on test. It is common knowledge that in Germany, first on the Munich-Thalkirchen line, later on the Cologne-Bonn line, then in Italy and various other countries, the tests made of this system at varying speeds and under different atmospheric conditions have



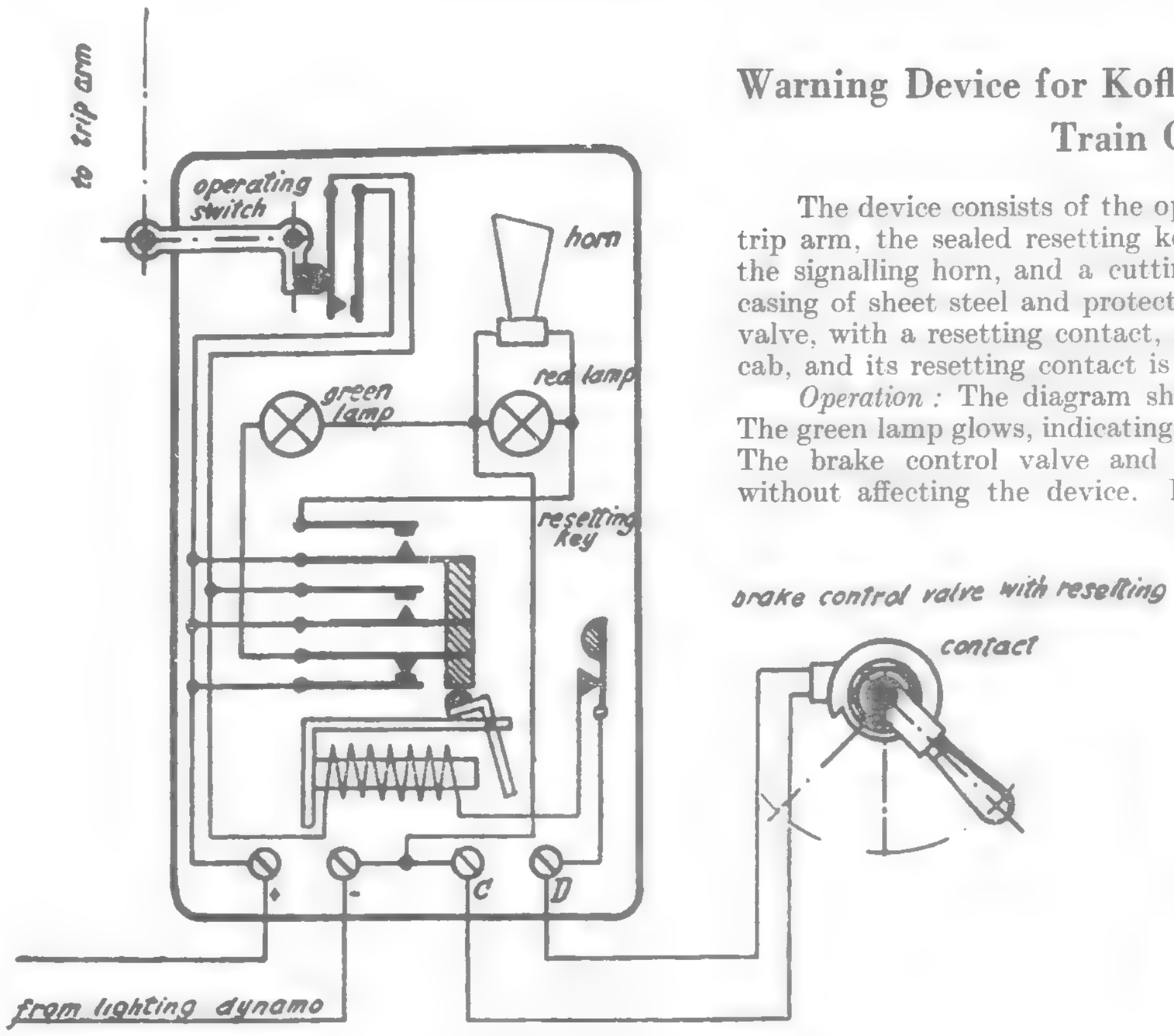
The mechanism, as it applies to the brakes, system "Kofler"

Electric locomotive, equipped with the "Kofler" safety device



Anchorage of the safety device on the line Cologne-Bonn

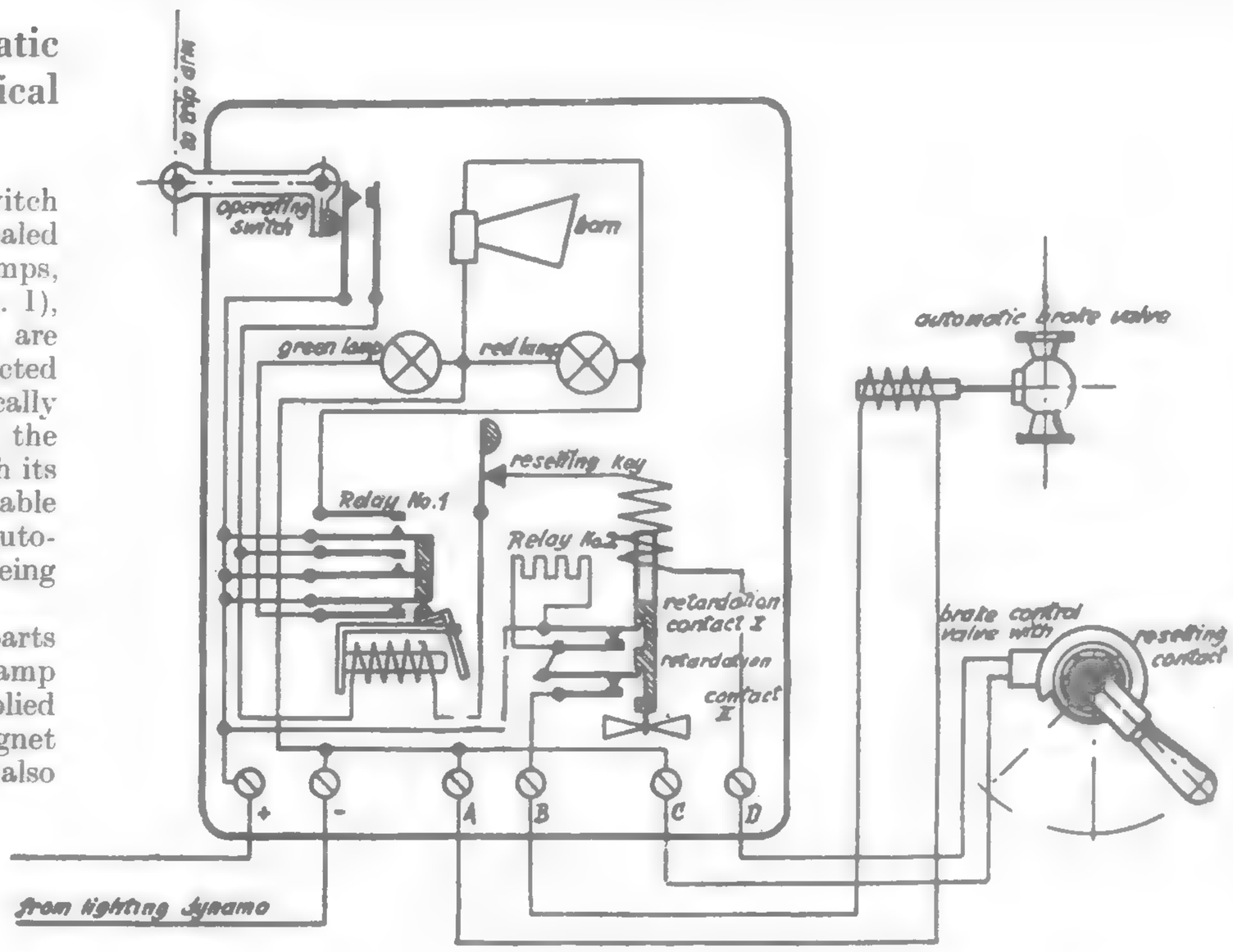
Warning Device for Kofler's Mechanical Scheme of the Train Control System



The device consists of the operating switch under the control of the trip arm, the sealed resetting key, the red and green signalling lamps, the signalling horn, and a cutting-in relay. All parts are housed in a casing of sheet steel and protected against damage. The brake control valve, with a resetting contact, is arranged in a suitable position in the cab, and its resetting contact is connected to the device by cables.

Operation : The diagram shows the parts in their normal positions. The green lamp glows, indicating that the device is supplied with current. The brake control valve and its resetting contact can be operated without affecting the device. If the operating switch is temporarily closed by the trip arm, the cutting-in relay is excited and maintained in this condition by its own holding contact. The interrupter contact of the relay breaks the circuit of the green lamp which ceases glowing, and its cutting-in contact makes the circuits of the horn and the red lamp. The horn is sounded, and the red lamp glows, until the driver operates the brake control valve which, through its resetting contact, returns the parts of the device into their normal positions. The sealed resetting key is provided for exceptional cases.

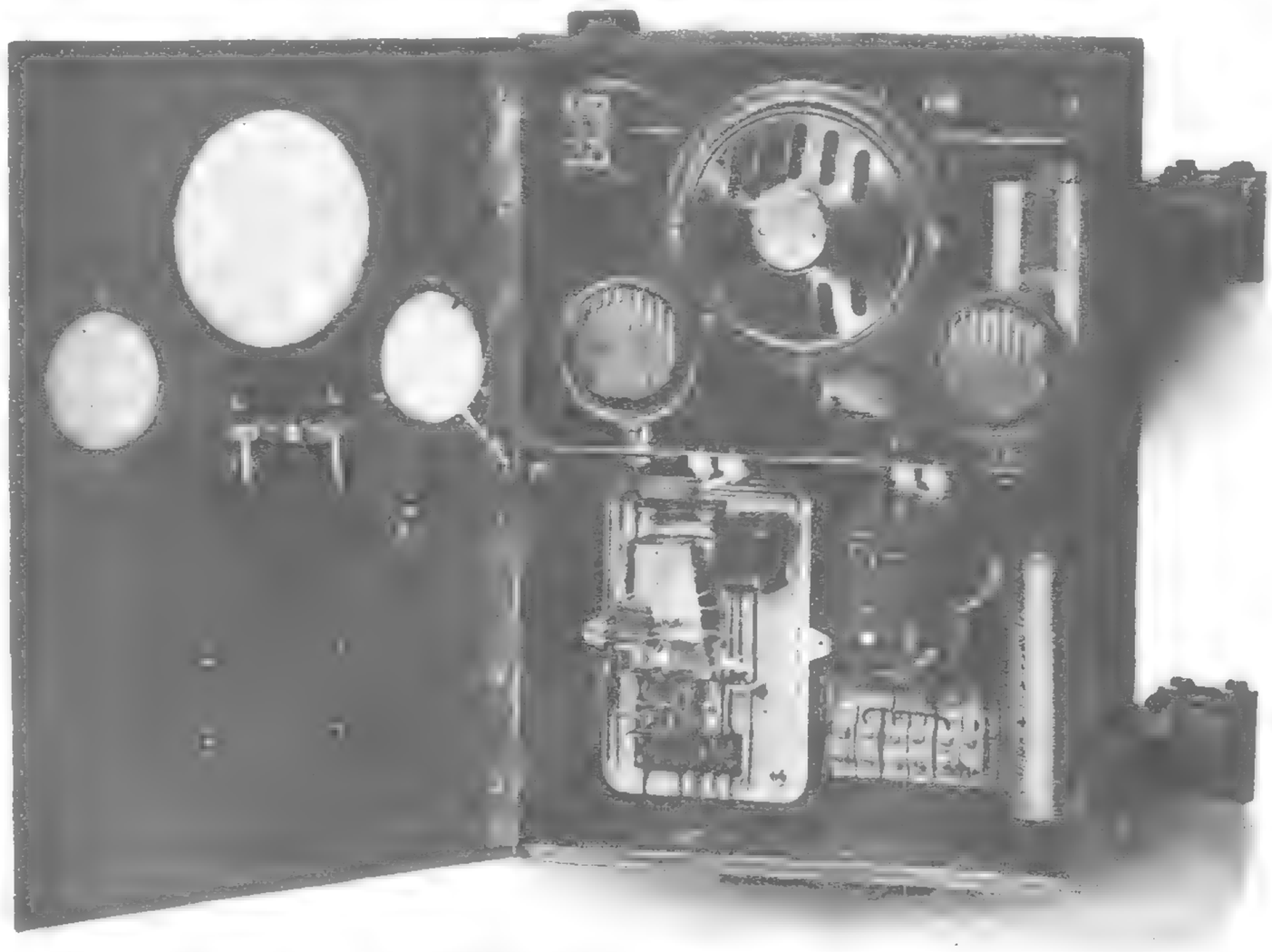
Warning Device with Automatic Brake Valve for Kofler's Mechanical Train Control System



The device consists of the operating switch under the control of the trip arm, the sealed resetting key, the red and green signalling lamps, the signalling horn, a cutting-in relay (No. 1), and a retardation relay (2). All parts are housed in a casing of sheet steel and protected against damage. The electro-magnetically operated automatic brake valve, and the manually operated brake control valve, with its resetting contact, are arranged in suitable positions in the cab, the control of the automatic valve, and the resetting contact being connected to the device by cables.

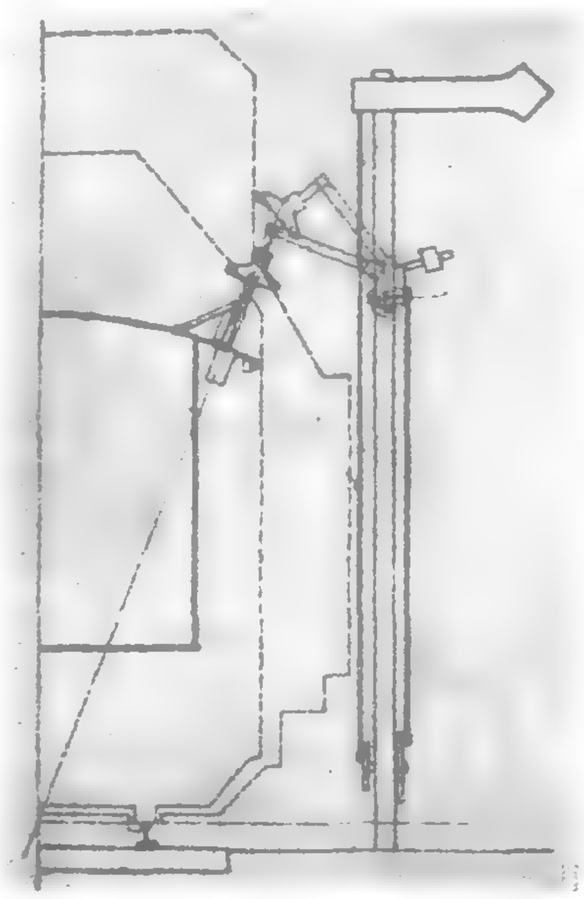
Operation : The diagram shows the parts in their normal positions. The green lamp glows, indicating that the device is supplied with current. The circuit of the magnet operating the automatic brake valve is also supplied with current, and the magnet keeps the valve closed. The brake control valve and its resetting contact can be operated without affecting the device. If the operating switch is temporarily closed by the trip arm, relays Nos. 1 and 2 are excited. The holding contact of the cutting-in relay No. 1 maintains both relays in excited condition. The interrupter contact of relay No. 1 breaks the circuit of green lamp which ceases glowing, and the cutting-in contact of relay No. 1 makes the circuits of the horn and the red lamp. The horn is sounded, and the red lamp glows. If the driver operates the brake control valve, the resetting contact of this valve returns the parts of the device into their normal positions. If the driver fails to operate the brake control valve, the retardation relay No. 2, after an interval of six seconds, opens retardation contact No. 1 which cuts a resistance into the circuit of the automatic brake valve's magnet, weakening the current in the circuit and allowing the valve to open partly and to set the brakes slightly. After an interval of seven seconds, retarding contact No. 2 is opened and breaks the circuit of the automatic brake valve's control magnet altogether, the automatic valve opens fully, and the brakes are now applied with full force. The brakes can be released by operating the brake control valve. The sealed resetting key is provided for exceptional cases.

always proved satisfactory. The Kofler mechanical system is a well designed, clear and simple lever transmitting system which is built into existing signalling devices without requiring material alterations of the plants, insertion of complicated line systems or electric energy, whilst electric reply bells can be easily provided for. The lever arm may be fitted to the signal or to a separate mast. It has a swinging movement operating with the signal. A sliding bow at its head, when the signal is at danger, makes contact with a device projecting sideways from the roof of the locomotive or motorcoach, which sets the brakes working, no matter what the speed or the driving system of the train, the receiver actuates the brake and the sounding of a luminous warning signal to the driver.



The warning device for Kofler's mechanical Train control system as installed in the engine

Due to suitable, ingenious padding of the levers and the transmitting mechanism to the engine, the speed of the running train is of no consequence for the strain on the parts concerned. One knows, however, nowadays, the materials which are allowed to be subjected to special mechanical stresses. But even these mechanical stresses offer no peculiar problem with the Kofler signalling system. It has been mentioned herein that the lever attached to the transmitting post and th receiving stirrups on the engine are so design d that the mechanical stress is of no consequence even at present-day high speeds. This has also been proved by the tests made on the Italian Nord-Milan railway, where the system operated equally satisfactorily and undisturbed at a speed of 93 miles per hour when subjected to tests on the Italian State Railway. Many Official records testifying to the dependability and strength of the Kofler device are available. The majority of Technical journals—referring particularly to leading English journals, such as *Railway Gazette, Railway Engineer and Locomotive and Wagon Review*; and to the official journal of the Italian State Railways *Rivista delle Comunicazioni Ferroviarie*; *Technisch Maandblad* of the Netherlandish State Railways; *Dansk-Togtidende*; leading French engineering reviews as *Technica. Les Transports Modernes*; *Sciences et Voyages*; *Science et Monde*; and leading German Railway engineering review *Gleistechnik und Fahrbahnbau* etc.,—have all endorsed the mechanical signalling system invented and designed by Engineer Kofler. Thus a considerable number of specialists have spoken in favor of it.



Sketch, showing the different phases of action of the apparatus

It seems well-timed to make tests of the Kofler signalling system in the Far East, to the end that a factor of great insecurity of the railway service may be eliminated. The mechanical transmission of signals is all the more justified since a single device costs only about a tenth or twentieth part of the amount necessary to purchase an electro-magnetic device, or an electro-optical appliance. Individual interests must here be resigned and general requirements met. The railway is an essential means of communication and railway safety service should be modernized to the greatest possible degree.

British Engineers' Association Handbook

The recently published "The British Engineers' Association Classified Handbook of Members and Their Manufactures," 1937 Edition, has been received by *The Far Eastern Review*. The object of this Handbook is to establish a closer contact between Buyers overseas and the Engineering firms which are members of the British Engineers' Association. It is hoped to achieve this object by spreading more widely a knowledge of their products and facilitating the direct transmission of orders and enquiries to them by providing, in concise but clear form, the information required for that purpose.

When special circumstances make it more convenient, enquiries may be addressed to the Association, which undertakes to transmit them to any particular firm or firms that may be indicated or alternatively it may be left to the Association to communicate the enquiry to selected member firms most likely to be able to fulfil the stated requirements.

British Locomotives on Canton-Hankow Railway

In the case of the new 4-8-4 giant locomotives which were recently imported into China from Great Britain for operation on the Canton-Hankow run, British builders were confronted with the problem of designing an entirely new type of engine.

Heretofore, English designers had been accustomed to meet the ever-growing demand for more powerful locomotives by redesigning existing engines, but in the case of this type of locomotive had to draw up an entirely new design. The Chinese Ministry of Railways' engineers specified that the locomotives should be capable of pulling trains of 700 tons, or fifteen cars each of a loaded weight of about 45 tons, at a maximum speed of 50 miles an hour on level ground and at from 15 to 20 miles an hour on a 1 in 75 grade. At the same time, the locomotives had to be suitable for the handling of freight trains of over 2,000 tons at about 20 miles an hour on ruling grades which averaged 1 in 200.

The power of any locomotive was absolutely dependent on the power of the boiler, which limited the capabilities of an engine, especially on long grades or at high speeds on level ground. For this reason, the designers had to provide the largest boiler possible, and in modern engineering practice the tendency was to design the locomotive round the boiler.

At the same time, it was necessary that the axle load be kept down to the minimum, and every possible method of reducing weight was resorted to by the designers. The thickness of the boiler shell was reduced by using high tensile steel: hollow axles were used in the coupled wheels: built-up, welded construction replaced castings wherever possible and practicable; tubing was used for all control rods; aluminium foil was used for lagging the boiler; and the tender was of all-welded construction.

The Chien Tang River Bridge

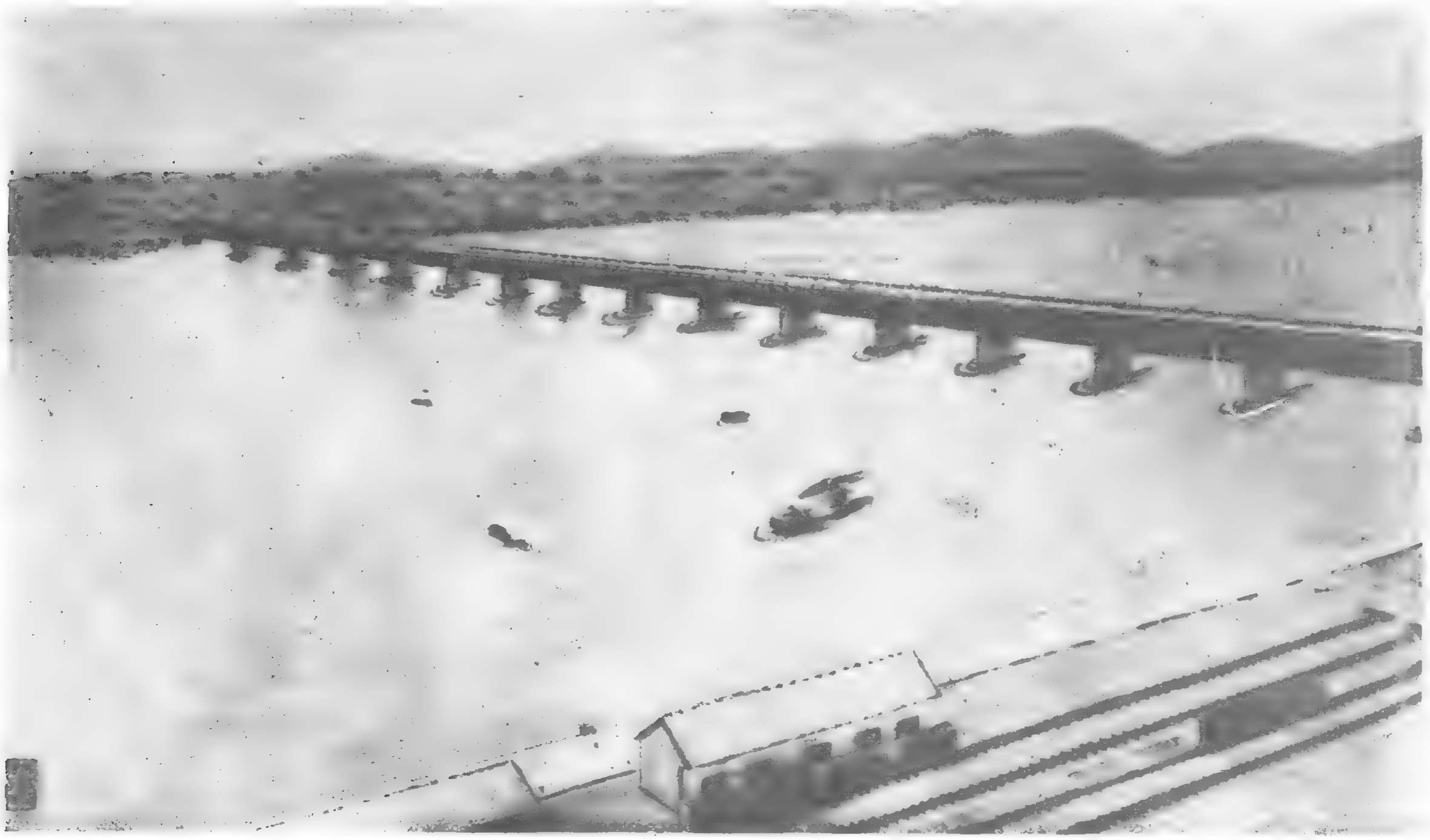
By T. E. MAO, Dr. ENG., Engineering Director, in The Quarterly Review of Chinese Railways

(According to ancient Chinese legend the dieties of the Chien Tang River, in Chekiang, became angered at man and as a punishment decreed that the Chien Tang River might never be spanned by the hand of man. Superstitious Chinese attributed a number of accidents that occurred when the Chien Tang River bridge was in course of erection to this ancient curse. Its power evidently has now lapsed, however, for the great structure now spans the stream and all the work of building it is nearly completed. While the work involved several contracts the major portion of the building of the structure was carried out by the well-known Danish engineering firm of Messrs. A. Corrit of Shanghai. This Danish firm built the fifteen main piers for the structure and, as sub-contractors for Messrs. Dorman Long, assembled and erected the steel work of the main spans).

It is of timely interest to review the progress of the work on the Chien Tang River Bridge, as the scheduled completion date is now rapidly drawing near. Because of its importance to the national railway and highway systems of the country, serving as a connecting link between Shanghai and Canton on the rail and between Nanking and Foochow on the roads, more than ordinary publicity has been attached to this work ever since its commencement on November 11, 1934. It is gratifying to note after struggling against nature for the past two years that the technical success of the entire scheme is now definitely assured.

The Chien Tang River, world famous for its bore, is one of the principal water-ways in the southeastern provinces of China, traversing through lands noted for their wealth and dense population. From time immemorial the land traffic across the river has been extremely heavy, especially between the cities of Hangchow and Shaoshing, situated near the head of the estuary where the river opens into the sea in the shape of a wide funnel. Far exceeding in width the Yangtze River at Nanking or Hankow, but obstructing almost the same amount of traffic across, the barrier of Chien Tang to the development of Hangchow and Shaoshing, and consequently the adjoining areas, has been most deplorable. Take the ferry at Hangchow, for instance, where about 20,000 people cross the river daily, there are the problems of the great length of the jetties—totalling about three kilometers, and the safety measures against wind and tides. Even with the utmost care in maintaining the service, the discomfort and delay experienced by the populace is inestimable. Prior to the introduction of modern communication systems into the Chien Tang territory, however, this great inconvenience was still not a very serious objection. With the construction of the many new railway lines—Chekiang-Kiangse Railway, Canton-Hankow Railway and the Hangchow-Tsaongo Section of the Shanghai-Hangchow-Ningpo Railway the situation began to change rapidly, and considering further the quick development of the national highways that cross the river, the necessity of a bridge at Hangchow became at once a problem of great importance. It is a problem because the demand for such a bridge was apparent even two or three decades ago, but the great width of the river and the unusual foundation difficulties proved for many years too big a task to accomplish, and there had been a popular belief that to build a bridge across Chien Tang was "impossible." It was not until the latter part of 1933, that a Commission was organized to study the project and prove that such an undertaking was entirely feasible.

Various schemes and designs, both engineering and economic, were studied and compared, and a final plan was worked out to suit the financial resources available. Through the untiring efforts of Mr. Tseng Yang-fu, then the Commissioner of Construction of Chekiang Province, and now the Vice-Minister of Railways, sufficient funds were raised in the course of a year, and an agreement was made between the Ministry of Railways and the Chekiang Pro-



Bird's eye view of the Chien Tang

vincial Government to build the bridge as a joint enterprise. At first, the cost of the structure, five million dollars, Chinese National Currency, was to be borne equally by the two parties, but after a revision this year, the Ministry undertook to share 70 per cent of the cost, leaving 30 per cent to the Province. The Ministry's share of 3½ million dollars was raised through the Shanghai-Hangchow-Ningpo Railway Completion Loan, underwritten jointly by the China Development Finance Corporation and the British and Chinese Corporation. The Province raised its 1½ million dollars through the banking group represented by the National Commercial Bank of Chekiang.

After approving the designs of the Commission by both the Ministry and the Province, tenders for the bridge were called in April of 1934, and the Commission was reorganized into an Engineering Office to take charge of the construction. There were 17 tenders filed, and these were opened on August 22, 1934. The firms participating in the competition may be classified according to nationality as follows : Chinese nine ; German four ; English, French, Denmark, Czechoslovakia, one each. After thoroughly studying the tenders by the Joint Committee of the Ministry and Province, the following contracts were awarded to four different firms :

For North Approach	Eastern Asia Co.
For South Approach	Hsin Heng & Co.
For Steelwork of Main Spans ..	Dorman Long & Co.
For Piers of Main Spans	Aage Corrit.

Materials and equipment began to arrive early in 1935, with the construction progressing slowly at the start but gaining speed everyday until it was in full swing shortly after.

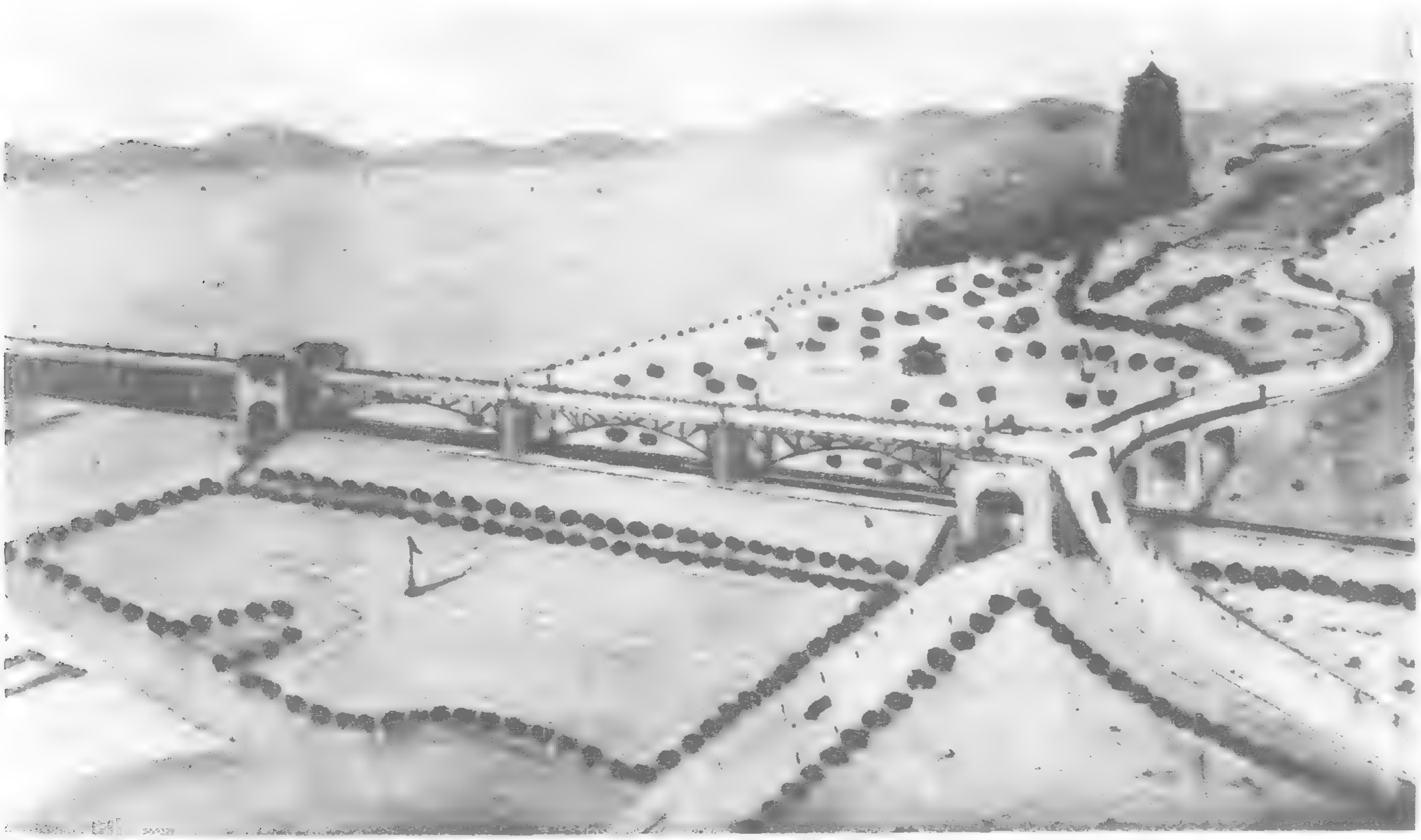
General Description of the Bridge

The bridge is located near the Zahkou station of the Shanghai-Hangchow-Ningpo Railway, and is about seven kilometers south of the business section of the city of Hangchow. It crosses the river in a north-south direction, and is at the narrowest and more permanent section of Chien Tang in the neighborhood of Hangchow. It has a total length of 1,400 meters consisting of (*a*) 16 spans of 67 meters each over the river channel. (*b*) 235 meters in the north approach and (*c*) 92 meters in the south approach. The structure has two stories—" decks," the upper one is for a six meter roadway and two 1½ meter sidewalks, while the lower one is for a standard gauge single track railway. The clearance under the bridge at mean water level is nine meters, and the grades are 0.33 per cent on the railway and four per cent on the roadway. The bridge is designed to carry simultaneously standard loading (Cooper's E-50) on the railway and 15 ton truck on the roadway, with heavy crowds on the sidewalks. All the design features conform with the " Chinese Government Railways' Specifications for Steel Railway Bridges."

Main Spans.—The superstructure of the main spans consists of steel trusses of the Warren Type, six meters wide and 10½ meters high, supporting the railway track at bottom and the roadway deck of reinforced concrete on top. Chromium copper steel, noted for its high strength, is used for the important parts of the structure, which is made and fabricated in England, with the exception of stringers which are fabricated in Shanghai. All the steelwork has to be carefully inspected during the processes of rolling, fabricating and assembling. After arrival at the site, the steel parts are assembled again and riveted to form a complete span of the bridge. Span by span are thus erected and temporarily stored on a timber jetty, which extends 100 meters into the river. As soon as two adjacent river piers are ready, one steel span is lifted up by pontoons, and floated to site. By means of hydraulic jacks and by making use of the tide, the span is put on the piers and adjusted into position.

Main Piers.—The substructure of the main spans consists of fifteen piers of reinforced concrete, each three meters by 10 meters at top and varying from 26 meters to 34 meters in height. These piers have to penetrate very great depths of fine silt and sand before reaching the bed rock which slopes downward from north to south where it is 45 meters below the river bottom. As the piers have to rest on rock, unusually deep foundations have to be executed to ensure the safety of the structure. It is of interest to note that a large number of the piers has such a great mass that the vertical depth from the surface of the roadway to the bottom of the pile foundation is no less than 70 meters—a distance even greater than the horizontal span length between two adjacent piers.

In order to secure the most economical design, five piers on the north side are made to rest on rock and ten piers on piles. Timber piles of 30 meters length are used for nine piers, 160 in each, while reinforced concrete piles of shorter lengths are used for the remaining one. The piers are " sunk " to the rock or piles by



River Bridge when completed

"Pneumatic Caissons." The "Caisson," 12 meters by 18 meters in area and six meters high, is the bottom seat of a pier the upper part of which is called the "shaft." The caisson is first lowered to the river bottom with the shaft built on top of it, inside a temporary "crib" wall which is demolished after the shaft stands well above the water level. Compressed air is then admitted into the caisson so as to keep off the water and enable workmen to excavate the river bottom inside the caisson. As the caisson slowly sinks down due to its own weight, the pier shaft is built on top of it, section by section. After the caisson reaches the desired depth, it is filled with concrete and the shaft finished to receive the steel spans.

Approaches.—The approaches on the two ends of the main spans consist of steel arches and reinforced concrete structures. The railway deck being at a low level, is carried on earth embankment which, on the north side, connects up with the present line of the Shanghai-Hangchow-Ningpo Railway after deflecting into the hills through a curve; and, on the south side, connects with the construction line of the same railway and the existing line of the Chekiang-Kiangse Railway. This linking up makes through traffic possible from Shanghai to Canton by way of the Shanghai-Hangchow-Ningpo Railway, Chekiang-Kiangse Railway and the newly completed Canton-Hankow Railway, with junctions at Hangchow and Chuchow. Because of the high level of the roadway deck, steel arches are used as supports, so as to avoid high embankment and to save the space of land. On the north approach the roadway is carried by three steel arches, and then by separate concrete trestles onto the hillside to join up with the road to Hangchow on the right and the up-river districts on the left. Similar arrangement is adopted for the south approach, except that there is only one steel arch span and only one branch to the left for connection with the existing highway.

There are altogether fifteen piers on the two approaches, two-thirds of which are on the north side. These include the two abutments which have to carry the main steel spans also. The north abutment is constructed by the process of "open caisson dredging," wherein concrete cylinders are cast at ground level, and earth inside the cylinders is dug out in open air. The water is kept away by continuous pumping. As the cylinders sink under their own weight, another section is cast on top and the process of excavating, sinking and casting is repeated until the cylinders reach rock at the desired depth. The south abutment has more difficult problems than the north, as it has to go down the same depth into ground as the main piers. Round "coffer-dams" of 15 meter steel sheet piles are first driven to form an enclosure in which the earth is removed and timber piles of 30 meter length driven to rock. Capping the piles with concrete, the abutment is gradually built up to the bridge seat. The other piers for the two approaches are executed by various methods to suit the geological conditions.

The Chien Tang River Bridge for which the British Firm Messrs. Dorman, Long & Co., Ltd., supplied and erected 16 main spans

End view of steel truss span of the Chien Tang River Bridge

First pier from north shore during the earlier stages of the construction

Review of the Progress

In reviewing the progress of the construction of the bridge which has been going on for two years, some of the technical problems may be recapitulated to gain an idea of the nature of the works involved. The chief difficulty lies, of course, in the fact that in addition to being the deepest foundation among all the bridges in China, the pier has to sink through a soil of the most complicated nature, while facing the tremendous actions of water current, and tide. Instead of excavating the foundation downwards and then build the pier upwards, thereby subjecting the construction work to a multitude of forces for a much longer duration in the unstable river, a quick and sure process has to be evolved that would enable the pier to be finished in the shortest time, and obstruct the river to the least extent. This is only possible by the use of caissons with which the pier is sunk and built up at the same time. Since reinforced concrete is used for the caisson and the concrete must be cast in the dry, a question arises as to the safest way of casting the caisson. Further, there are the piers with piles under the caisson, and these piles have to be driven at the same time while the caisson is being cast. This leads to the method of casting the caisson on shore and floating it to site after the pile foundation is in shape. To transport an object (caisson) weighing more than 600 tons on land and water and manipulate so it will rest on quick-sand (nature of river bottom) exactly in position, is some innovation in the art of bridge building. The piers with pile foundation have the further difficulty in that the piles have to be driven in water before the caisson is in place. As the caisson has to be sunk sufficiently into the soil to sustain the effect of the deepest scour, the piles have to be "buried" far below the riverbed in order to come under the base of the caisson. This necessitates the use of a "follower" which pushes down the pile through

water and mud to its final position and has to be withdrawn thereafter. There is no trace of the pile in sight while sinking the caisson, but one has to fit the other when they meet underground, 12 or more meters below the river bottom. This is also an engineering feat. During the construction of the piers, six or seven caissons are to sink at the same time, and the working program has to be so arranged that the use of material and equipment is to their best advantage by proper co-ordination.

For the main spans of the bridge there were discussions concerning the use of alloy steel. Modern products of high tension alloy steel have certainly been gaining favor in bridge construction nowadays, but due to the lack of standard specifications, very careful studies have to be made in working out the design. It was only after making thorough tests and endorsement by prominent engineers that chromium copper steel was adopted for this bridge. Methods of erection of the spans have also engaged the utmost attention of the engineers. If the piers were to be finished in order from the two shores towards the center of the river, the simplest way would be to erect the steelwork by cantilevering from the span previously in place. The program of piers, however, called for completion of the same at random, and it was not possible to erect the steel spans in a continuous operation by cantilevering. Floating method has to be used, wherein a complete span could be carried from the land onto the piers irrespective of the order of the piers. Considering the size and weight of a complete span and the risks involved in such work in a river of strong current and tide, extraordinary measures have to be taken to carry it out to success.

The approach spans and piers being executed on land seem to need no special mention. But the quick-sand nature of the soil into which the piers have to penetrate gave rise to unusual difficulties in excavation and pile driving. In any open cut the soil could be dug down only to a certain level, below which an ordinary attempt to excavate is futile, as the soil below would immediately come up after the superimposed layer is removed. Similarly, in pile driving the resistance is so high that by mere hammering there is the risk of bending or breaking the piles.

A view of the 720 ton traveling crane for transporting pre-cast piers to deep water

It is very evident from the above that in constructing the Chien Tang River Bridge there is needed a very large display of mechanical equipment, in addition to the technical skill of the engineers. By taking advantage of Nature, the caisson is made to float *by water*, the excavation carried on under water *by air*, and the steel span elevated to the pier top *by tide*, but all these operations must depend on mechanical power. And bridge building is a new art in China, the more so as to the equipment. Almost all of the mechanical devices, floating or on land, have to be specially designed and built for the particular use of this job. The advantage of cheap labor of this country is, in most cases, more than offset by the large investment in equipment, and it has probably worked more hardship to the contractors than in any country abroad where hired equipment is available. Furthermore, there is the element of time consumed in making the equipment which is even more important than monetary considerations. During the first year of the work, more than ordinary attention had to be paid to mechanical equipment, as this was pre-requisite to any work in the field. Incidentally, it also explains why the equipment has to be duplicated to such an extent as to compensate the time lost at the start by accelerating during the later stage of the progress. On many occasions, operations on certain piece of work had to stop because the machinery may need some repairs or replacement that may amount to only one thousandth the cost of waiting. Strenuous efforts have to be made in order to live up to the budget of the bridge as regards both time and cost.

The contract for the construction of the main piers was signed with Mr. A. Corrit on November 11, 1934, and work was started shortly afterwards. The first pier had its caisson begin sinking under pneumatic air on September 25, 1935, and was completely finished on April 27, 1936. The other piers had caissons floated out from land; each took about three months from casting to setting in place. Three of these caissons have now sunk to rock and two of them are nearly finished. Five caissons are now in the process of sinking, and four caissons have been set in position with concreting going on inside their crib walls. So across the river there are now thirteen piers to be seen, with only two more yet to build. The pile foundation was first begun on November 4, 1935, and seven of the nine piers were finished on July 6, 1936.

The contract for the main steel spans was signed with Dorman Long & Co. on December 6, 1934, and the first shipment of steel work arrived at bridge site on January 8, 1936. All steelwork of the sixteen spans has arrived, the last shipment on June 3, 1936. Five spans have been assembled and riveted up, and preparations for floating the spans onto the piers are now complete. The first span will be erected on the piers by the end of this month (November).

The contract for the North approach was signed with East Asia & Co. on February 11, 1935. The steelwork for the arch spans was supplied by Siemens China Co. from Germany. The first pier was built on September 19, 1935, the first steel arch erected on March 5, 1936, and the North abutment finished on June 7, 1936. At present, all the ten piers have been finished, the three arches erected, and the two flanking highway trestles built up, together with the roadway slab on two of the arch spans.

The contract for the South approach was signed with Hsin Heng & Co. on February 11, 1935. The first pier was completed on January 11, 1936, the arch span erected on August 3, 1936, and the South abutment finished on September 20, 1936. With the exception of the roadway slab on the arch and the platform between the arch and the main spans, all of the works on this side is now practically complete.

It is hoped that the working conditions for the next half year will be favorable enough to ensure the completion of the bridge by the end of June next year, as originally planned.

CONSTRUCTION FEATURES OF CHIEN TANG RIVER BRIDGE

The Design

As a device for quick traffic across the Chien Tang River, which geographically speaking, does separate Chekiang into two halves and is generally regarded as a very poorly navigable river, the building of a bridge was proposed long ago. Since 1935, the long proposed plan has been practically carried into effect; despite various difficulties, so far as its design and construction are concerned the bridge is now wholly completed.

The original design of the bridge was made by Mr. Waddle, an American specialist in bridge building. Afterwards, a committee was appointed by the government to take charge of the design and construction work. After serious and perseverant study, the following principles were specified in the design:

(1) Owing to the shallow water and the shifting sand river-bed, the piers supporting the bridge should be equally spaced, mainly for convenience of navigation.

(2) Owing to its various traffic uses, the bridge should be designed to meet heavy traffic conditions.

(3) Owing to its strategic position in national defence, the bridge should be designed with sufficient reference to military utility.

(4) Owing to its beautiful surroundings, the bridge should be designed in good proportion and size.

In accordance with the above principles, six different designs were made by the committee, and after very careful and strenuous study it was decided to use the 220-ft.-span through truss design in construction.

The selected design gives a double course through truss bridge with 16 spans, each 220 feet long, the total length of the bridge being 3,520 feet. The depth of the truss is 35 feet. The distance between trusses is 20 feet.

Floating pile-driver, used during the fundamental stages of the construction

The trusses are designed of Warren's type. The top course of the bridge is designed for highway traffic with pedestrian sidewalks, all paved with reinforced concrete slab, seven inches in depth, supported on steel cross-beams, which are connected to the upper chords of the trusses by riveted joints. The bottom course is for a railroad and is composed of rails, ties, and cross beams. The upper and lower chords of the trusses are all designed to be strengthened by lateral bracings, jointed by steel rivets. The whole bridge is designed to be supported on fifteen reinforced concrete hollow piers which are practically sunk into the bottom of the river, some 70 feet below the highest water level. Near the south bank of the river, on account of the sand river-bed, the piers are designed to be supported on wooden piles, some 100 feet long, driven into the bottom, whereas, on the north bank where the rock stratum is much higher, the piers are designed to rest directly on the rock stratum, no piles being needed. At either end of the bridge, approaches are designed to connect the bridge itself with the bank.

The Foundation Work

In the foundation work of the bridge, six different processes were put into use. (1) Ordinary excavation process: Where the rock stratum is not far from the ground surface, the piers are designed to rest directly on the rock stratum by first excavating the earth to a certain depth. (2) Pile foundation process: Where the rock stratum is very low, wooden piles are first driven to the bottom to support the piers. The piers C1. C2, and I to J2 are thus supported. (3) Open caisson process: Where the rock stratum is much lower, open caissons are used. (4) Pneumatic caisson process: Where the rock stratum is very far and the deposit sand is too thick. pneumatic caissons are employed. The principle involved is the utilization of the difference between the pressure of the air inside and outside of the caisson. A pneumatic caisson is practically a gigantic diving bell, upon the top of which the pier is to be built. The piers No. 1 to 6 were designed to be constructed by this process. (5) Pneumatic caisson and pile foundation processes combined: Where the rock stratum is too far to reach even by the pneumatic caisson itself, it is required to drive piles first. (6) Steel sheet-like coffer-dam and pile foundation processes combined: Where the rock stratum is very far from the surface and the liquid sand underground is very much in excess, it is required to construct a steel sheet-pile coffer-dam first; then, the liquid sand may be removed and piles be driven. This will give a very perfect foundation, and piers may be built upon it. The foundations of the two piers at the south bank are arranged by this combined process. The general arrangement of the foundation work of the bridge is shown in fig. 1.

The aforesaid processes were duly employed in accordance with the required conditions. The original construction scheme is given in the following:

The six piers D to F4 of the north approach were to be constructed by the excavation process and laid right on the rock stratum as shown in fig. 2.

The two piers C1 and C2 were to be built by the pile foundation process. Piles of 50 to 90 feet were to be driven first to the rock stratum, as shown in fig. 3.

The southern two piers of the north approach were to be built on open caissons.

For the piers of the main bridge, from No. 1 to No. 6, sheet pile coffer-dams were to be constructed for removing the existing water; pneumatic caissons were then to be sunk downward to the rock stratum with the piers built thereon. For the piers No. 7 to No. 15, 90 to 100 feet wooden piles were to be driven to the rock stratum first, sheet pile coffer-dams being constructed. The same process as for piers No. 1 to 6 was to be repeated, excepting that the foundation of the dam was to be the top of the piles instead of rock stratum. See fig. 5.

The construction of the two piers by the south bank required the construction of earth coffer-dams with a view to sinking open caissons therein. Till the caisson sank to a depth of some 25 to 30 feet, 100 feet piles were to be driven through it. The other three piers at the south end were to be constructed by first excavating the earth to certain depth and driving 50 to 90 foot piles.

The First Revision

According to the above scheme, the whole process of the construction work was estimated to take some 715 days. Owing to the time limit ordered by the government, setting 400 days as the maximum, the original scheme had to be revised. According to the original scheme, the construction of the piers by the north bank was to be completed within 400 days; the construction of the piers

of the main bridge in the middle of the river, however, could hardly be completed within this limit, unless the caissons were constructed at the same time as the piles were being driven. On account of the tremendous current of the river stream and its shifting sand bed, special means and efforts were required to protect the sheet pile dam from drifting ; moreover, the bracing of the dam proved a very big difficulty. For Nos. 2 and 3 piers, steel sheet pile coffer-dams were to be built, spacious enough to contain two caissons each ; for pier No. 4, the same coffer-dam was to be erected, capable of containing three caissons. Then, seven caissons were to be made up when piles were driven at the same time. Till the caissons were strong enough, the dams had to be opened and the seven caissons drifted to their respective positions to sink. The dams closed again, another seven caissons were to be built, three of them to be sunk by pneumatic process and the rest being drifted to the respective spots of piers No. 10 to 13. The bottom of the river at pier No. 15 being much higher, a small artificial island was to be built by depositing earth. It would then be a convenient device to construct the caisson right on the island and let it sink by its own weight. See fig. 7.

As to piers H and G, steel sheet pile coffer-dams were to be employed to excavate the earth to certain depth ; 100 feet piles were to be driven with the piers erected thereon.

However, since the south bank is rather lower and liable to be washed by high tide, it would be necessary to construct a permanent earth dam to protect the inside construction work, this bringing forth quite a deal of trouble.

Excavation by hydraulic ejector was one of the major tasks before the placing of the piers was possible

The Second Revision

Although the scheme was revised, it would have still taken some 600 days to complete the foundation work, so another revision was made. The second revised scheme had much the same features as the first revision, except the use of steel plate caissons instead of reinforced caissons. The steel caissons, after being drifted to their positions were to be filled with concrete in order to sink by their own weight. This would certainly have saved much time, some 465 days being estimated for the completion of the construction work. Owing to the lack of suitable steel plates and angles, the scheme was made in vain.

The Third Revision

Thus at the third revision it was decided to adopt the drifting method of caisson skeletons, as shown in fig. 9.

Caissons skeletons were to be built ashore light enough to float on the river. When strong enough, they were to be floated to their respective positions and then filled with concrete so as to sink. The pile driving work was to be done at the same time when the caissons were in the making. This would afford rapid results.

Although the construction schemes had been carefully studied and revised, owing to the unusual conditions of the strange river, there were quite a number of changes in the construction procedure. Originally, the caisson skeletons were designed to slide down to the river, but owing to the obstacle of liquid sand, the sliding process was mainly rendered ineffective. The hanging process was then employed. This gave much trouble in various respects. A series of attempts were needed to conquer different troubles. This took up much time. The piers Nos. 14 and 15 were originally constructed on small artificial isles which were protected by steel sheet-pile coffer-dams. However, they were all damaged by the inundation during last summer. This made necessary much more time to improve the process.

Changes frequently happened at the bottom of the river ; the water level was quite uncertain : clashes between the river current and the sea tide gave birth to a variety of current conditions in the river. All these afforded difficulties in the construction of the foundation work.

The Superstructure

The total length of the superstructures of the main bridge is 216 feet, and is equally divided into 16 simple spans. The length of the north approach is 160 feet, with three arch openings and two plate girder spans. The length of the south approach is also 160 feet, with one arch opening and one plate girder span only. A brief account of the superstructures of the whole bridge will be given in next month's issue.

(To be continued)

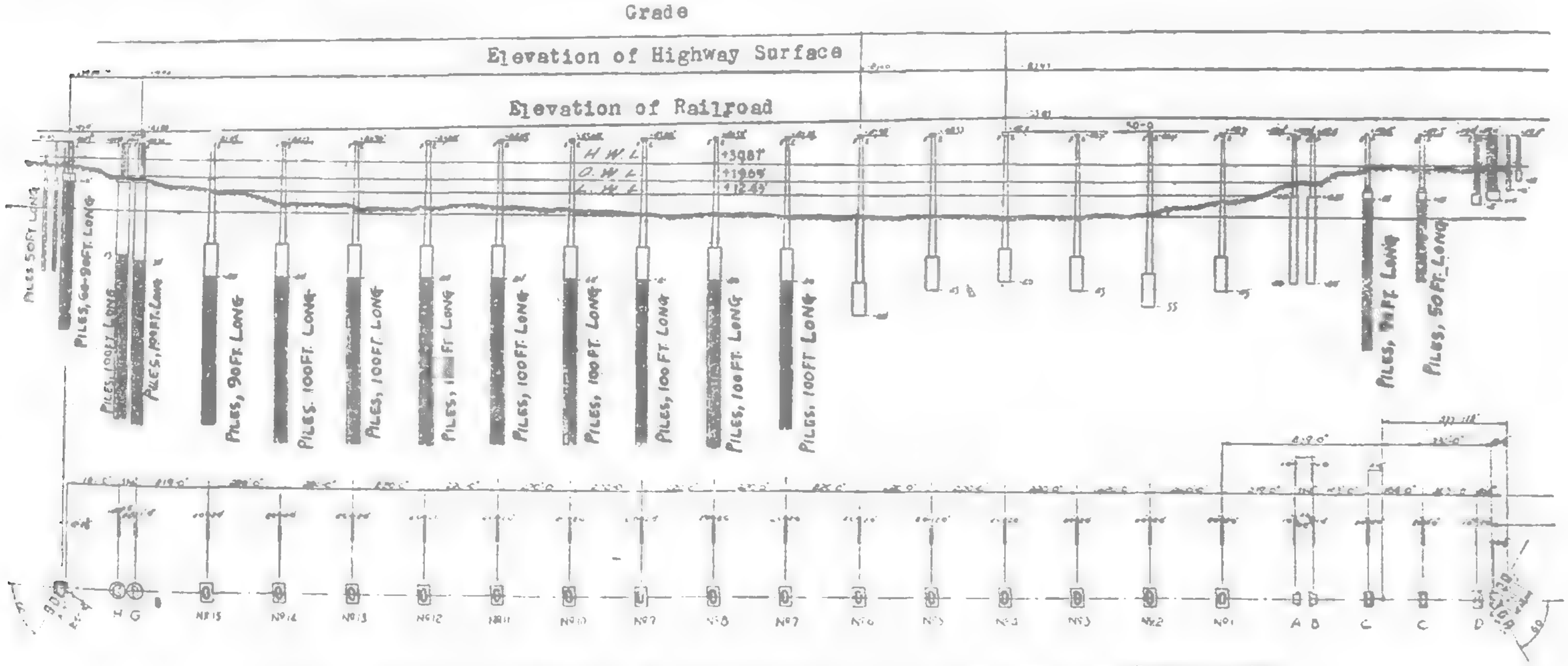


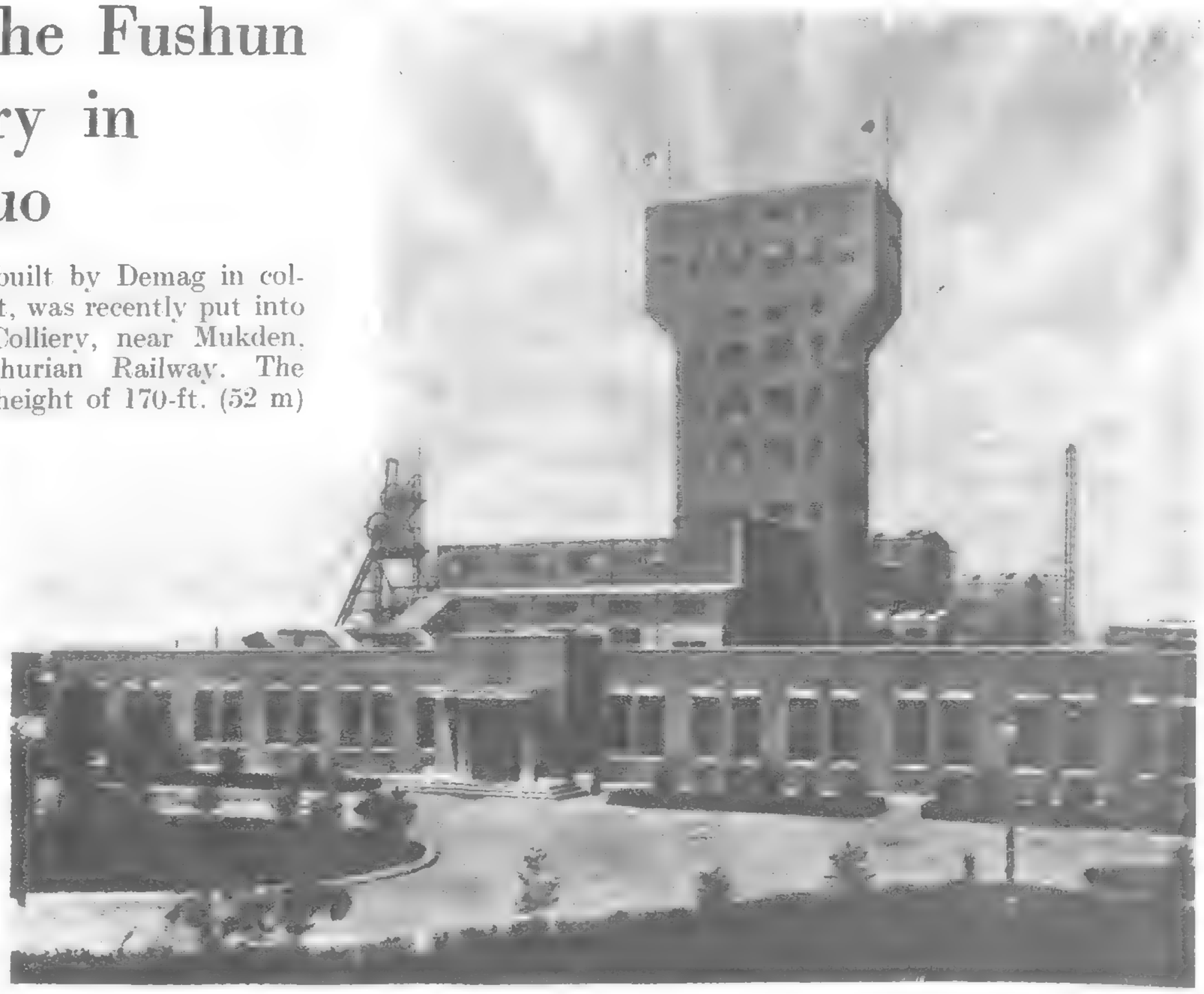
Fig. 11.—General arrangement of the foundation work of the Chien Tang River Bridge

Winding Plant at the Fushun Ryuho Colliery in Manchoukuo

A NEW tower-type winding plant, built by Demag in collaboration with Siemens Schuckert, was recently put into service at the Fushun Ryuho Colliery, near Mukden, belonging to the South Manchurian Railway. The electric winder installed in the tower at a height of 170-ft. (52 m) above ground level, measured to the center of the driving sheave, which, at a winding speed of 75-ft. (23 m) per second hoists 560 tons per hour from a depth of 2,525-ft. (770 m), may well claim to be one of the most efficient winders in the world.

The general view will convey some idea of the size of the plant, for which Demag supplied not only the winder but also the steel skeleton of the tower and the entire shaft equipment both at the surface and underground, such as cages, shock absorbers, rope clamps, safety catches, electric onsetters, swinging platforms, tub brakes, etc.

The winder has an all-welded Koepe driving sheave of the Demag type with cast-steel hub and arms and rim of steel sections. The diameter of the driving sheave is 25-ft. (7,500 mm) and that of the deflecting sheave, lower down, 21-ft. (6,500 mm).



General view of the tower-type winder at the Fushun Colliery in Manchoukuo. The unusual size of this plant becomes evident by comparing the new tower with the old headgear alongside

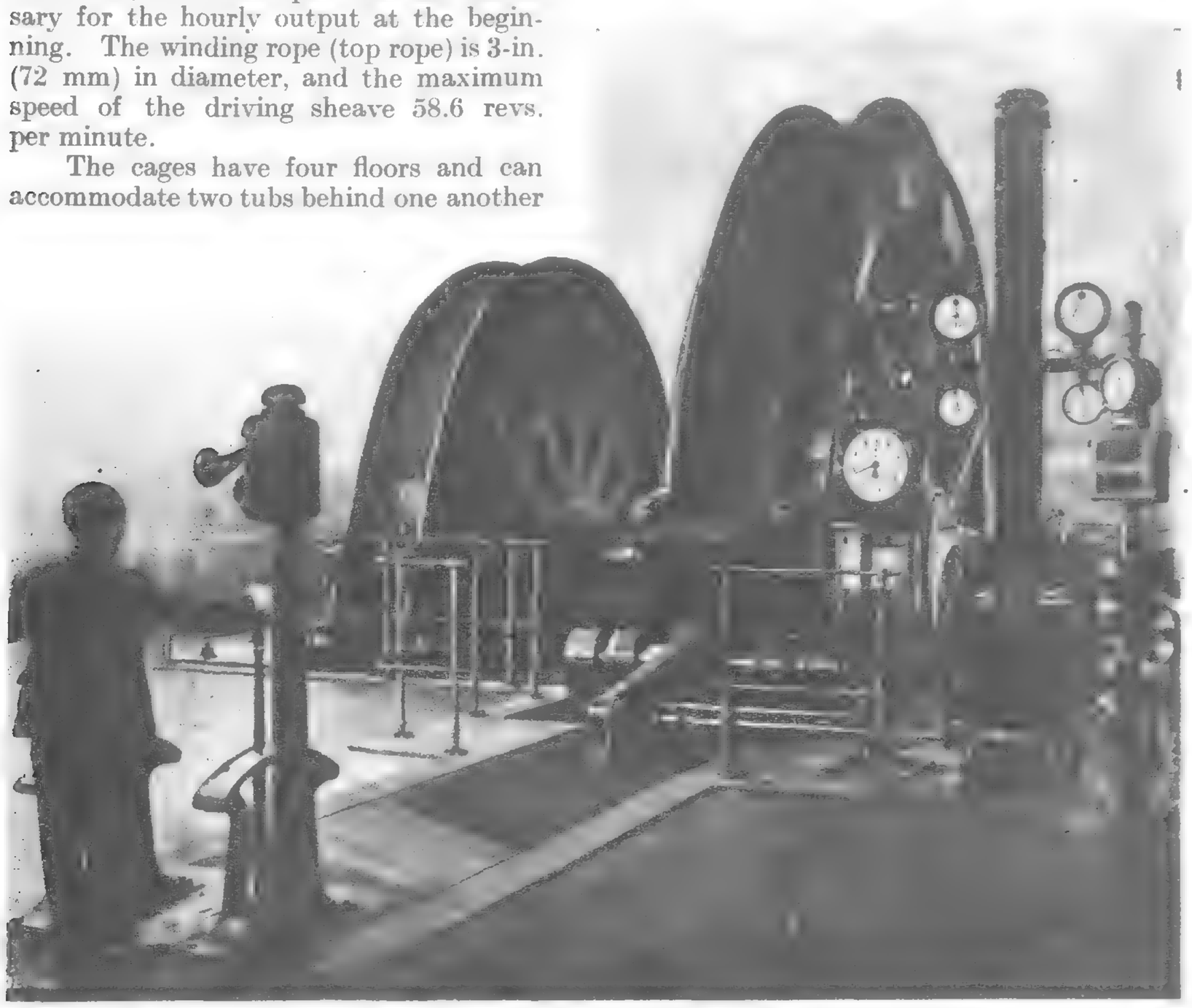
The hourly output of the winder at the beginning will be 650 tons from a depth of 1,213-ft. (370 m) and later on 560 tons from a depth of 2,525-ft. (770 m). As the useful load of the coal hoisted is 12 tons, 53.5 winds per hour are necessary for the hourly output at the beginning. The winding rope (top rope) is 3-in. (72 mm) in diameter, and the maximum speed of the driving sheave 58.6 revs. per minute.

The cages have four floors and can accommodate two tubs behind one another on each floor. In order to improve the winding output, the tubs are drawn off two wayboards simultaneously, so that the cages require to be shifted only once. As customary in the case of Koepe drives, the plant works with the weight completely balanced by a tail rope.

The electric onsetters at the wayboards and ingate for double hoisting can push alternately two tubs, one behind the other, into the cages and push out those standing in the cage. The driving motor works on to a worm gear which, through two friction change gears, moves the two rope drives with the onsetting carriages, whereby the rams push gently on the buffers when pushing in the tubs.

Pneumatically operated tub brakes, capable of stopping 25 tubs, running on their own, and of letting always two tubs through into the onsetting position, are installed in the tracks running up to the cages.

Further equipment includes the compressed air drives for opening and closing the shaft doors, swinging platforms and ramps at the ingate and wayboards which are likewise operated pneumatically.



Electric winder, located in the tower at a height of 170-ft. (52 m) above ground level and brings up 560 tons from a depth of 2,525-ft. (770 m) at a speed of 75-ft. (23 m) per second

Railway Orders Sleepers

For the construction of the Nanchang Pinghsiang section of the Chekiang-Kiangsi Railway, 80,000 sleepers have been ordered from the Kiangsi lumber yards by the Railway Administration to be used on the projected line. A contract to that effect has already been signed between the parties concerned.

Aviation In China

By DAI ENKI, Managing Director of The China National Aviation Corporation

In 1929, the National Government of China planned the establishment of a network of modern commercial airlines throughout the country, and the foundation stone was laid in the creation of China National Aviation Corporation. The Ministry of Communications was delegated to negotiate with China Airways Federal Inc., U.S.A., an agreement for the financing and operation of the company jointly. In order that the control of the company should rest with the Government, the company was registered at the Ministry of Industry and Commerce, with head offices in Shanghai, the Ministry subscribing to 55 per cent of the capital and China Airways to 45 per cent of the capital.

Development of airlines in China by China National Aviation Corporation was at first concentrated in the establishment of an air service between Shanghai and Chengtu, via Nanking, Anking, Kiukiang, Hankow, Shasi, Ichang, Wanhsien and Chungking, all of these points being important commercial centers along the mighty Yangtze River.

The history of commercial aviation in China actually commenced on October 20, 1929, when the first mail and passenger plane left Shanghai for Hankow on its maiden trip, covering the distance of 864 km. in seven hours' flying time. From that date to September 20, 1935, service on this route was maintained by the use of Loening flying boats.

On September 20, 1935, tri-motored Ford planes were placed on service on the Shanghai-Hankow section, replacing the Loenings on this section, and thereby immediately reducing the flying time between Shanghai and Hankow by two hours and making it possible for a plane to fly the round trip Shanghai-Hankow-Shanghai in a day.

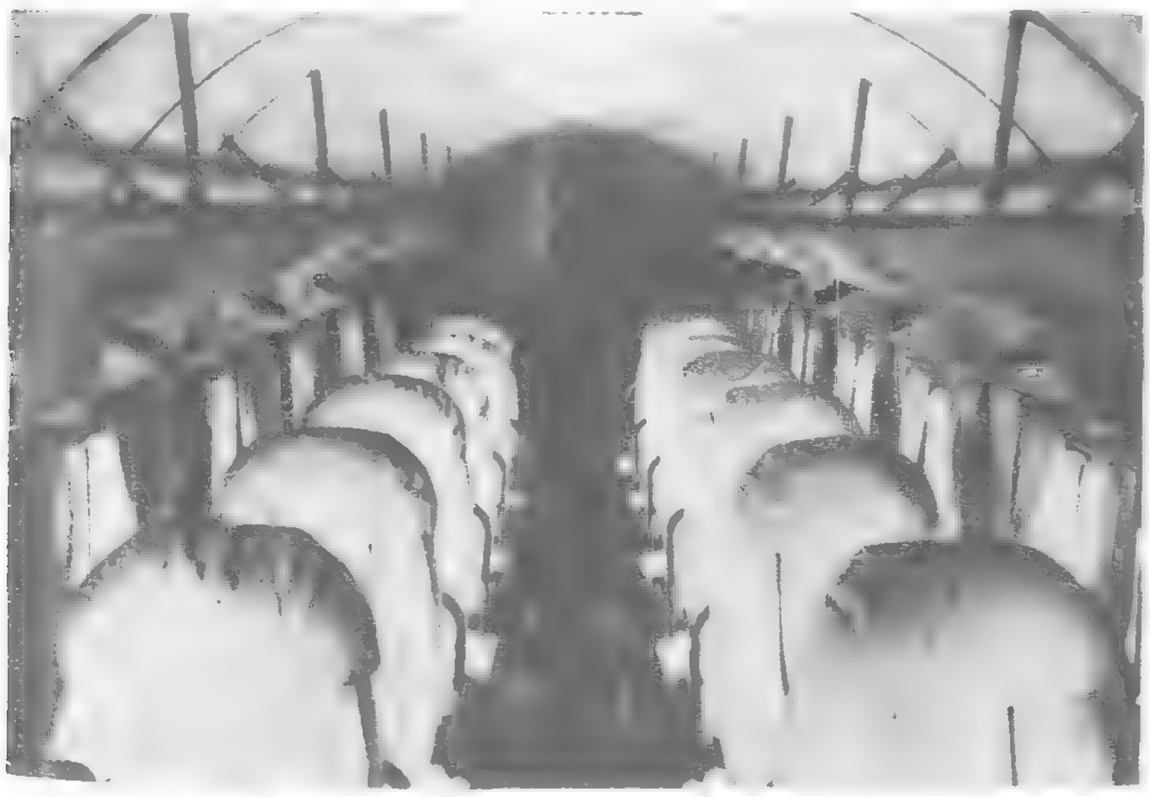
The public's attention was, however, more particularly drawn to the advantages of commercial aviation on October 23, 1935, when the first Douglas Transport plane was placed on service on this line and the section Shanghai-Hankow was covered in less than three hours' flying time. A twice-weekly express service between Shanghai and Chengtu was inaugurated with Douglas Transport planes, the distance between Shanghai and Chengtu, 1,981 km. being covered in less than seven flying hours. In July, 1936, the express service from Shanghai to Chengtu was augmented to three trips weekly.

Douglas DC 2 of the China National Aviation Corporation over the Great Wall, Peiping

Shanghai-Peiping Line : Service on this route was inaugurated on January 10, 1933, when a Stinson monoplane took off from Shanghai for Peiping, via Haichow, Tsingtao and Tientsin, all important commercial ports on the North China Coast, covering the distance of 1,197 km. in seven and one-half hours' flying time. On May 14, 1935, rapid service was put into effect between Shanghai and Peiping, via Nanking, Tsingtao and Tientsin, by the use of the Douglas Transport, the longer distance of 1,327 km. via Nanking being covered in four and one-half hours' flying time. At first two round trips weekly were flown by the Douglas Transport, but the popularity of this service induced the company on June 9, 1936, to increase the schedule flown by the Douglas Transport to four round trips weekly, a round trip Shanghai-Peiping-Shanghai being flown by the same plane in one day. It would not be out of place to emphasize here the fine work of the various flight crews in completing flights of 2,654 km. in a single day.

The *Shanghai-Canton* Line, via Wenchow, Foochow, Amoy and Swatow, all important ports along the South China Coast, was inaugurated on October 24, 1933, with Sikorsky flying boats. The Sikorsky planes were replaced in November, 1934, by the faster Douglas Dolphin Boats, and with this equipment the distance of 1,623 km. between Shanghai and Canton is covered in less than seven hours' flying time.

The *Chungking-Kunming* (*Yunnanfu*) section, via Kweiyang, was inaugurated on May 4, 1935, a tri-motored Ford plane being



The interior of the C.N.A.C. Dougals DC 2

Part of the China National Aviation Corporation's Fleet—Douglas DC 2

used on this section and the distance of 755 km. being covered in less than three and one half-hours.

Through service to Europe, and the participation of China in the world's network of international air services, was made possible on February 13, 1936, by a contract entered into between China National Aviation Corporation and Air France, and to commence with, a round trip is being flown weekly between Canton and Hanoi. Before the end of the year another connection with Europe, via Imperial Airways at Hongkong, is contemplated.

It is possible to-day to travel oy the huge modern planes of C.N.A.C. throughout China, from North to South, from East to West, far into the interior of the country, with the greatest saving of time. The manifold difficulties, hardships and discomforts of traveling to remote parts of China are now things of the past, and in the near future all of the eighteen provinces of China will be accessible with ease and comfort to air travelers.

Aside from the many advantages commercial aviation gives to commerce and the public in general by speeding up the means of communications and travel, has proved and will continue to prove to be a great aid to the Government in controlling and governing a country as large as China. Whereas it formerly took days, weeks and even months for officials entrusted with important duties to travel between the capital and distant provincial cities, it is now only a question of hours. It can be truly said that commercial aviation has done a good deal towards the aim of the National Government—peaceful unity of the people of China.

Of recent years China National Aviation Corporation, once their pioneering efforts were successfully accomplished, have been working with patience and energy towards giving the public a service comparable with the best of any other country in the world. Small and slow planes have been gradually replaced by huge and fast equipment. Ground facilities and safety devices have been brought technically up to date. It must not be imagined that success came as a matter of course. It is only the public's support, backed up by the enthusiasm and co-operation of the entire personnel of the various departments of the company, that enabled us to overcome great difficulties in its pioneering days. Contrary to established practice throughout the world, this company, since the day it was founded, has been financed and operated as purely a commercial undertaking without receiving from the Government anything in the nature of a subsidy.

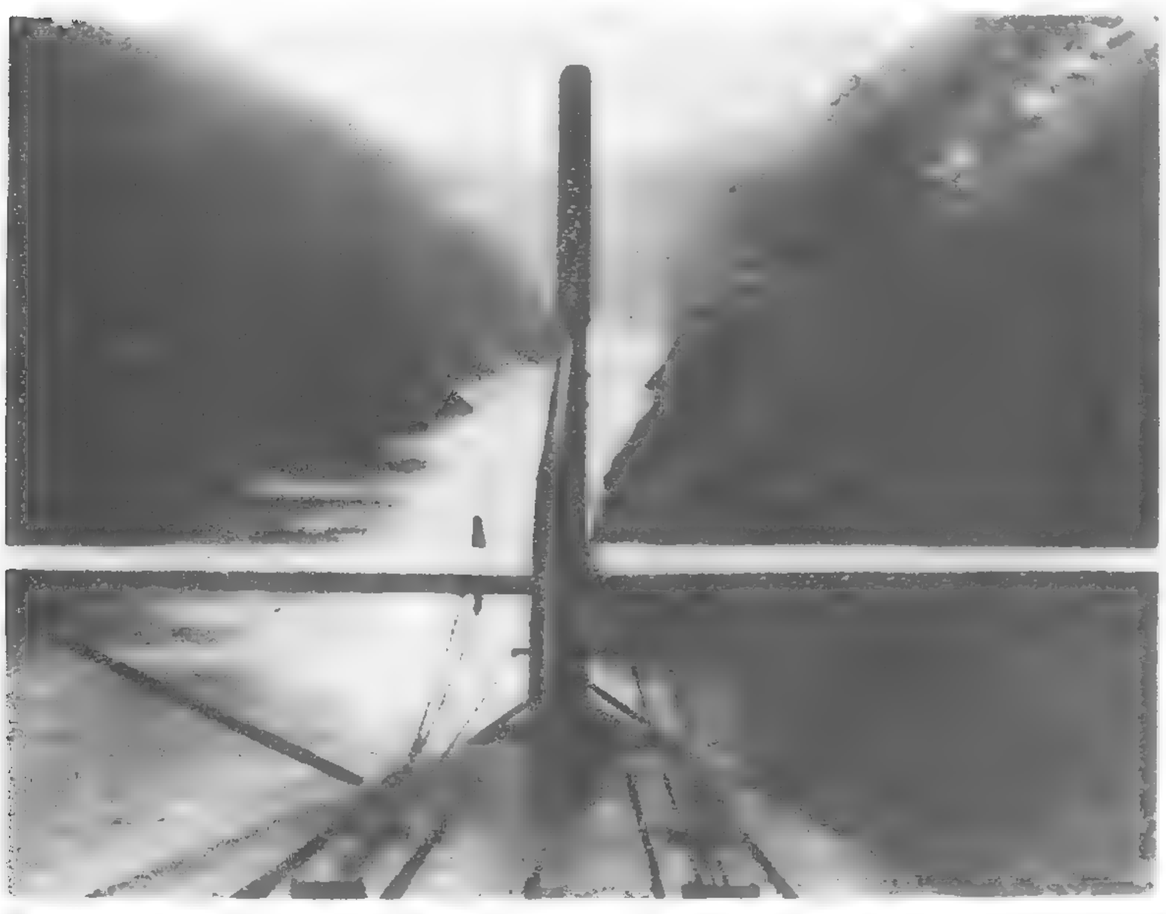
One of the most vital problems now facing C.N.A.C. and the development of commercial aviation in China is that of proper and modern airports in all the important cities served by commercial airlines.

Unfortunately, however, the various cities whose duty it is to supply and maintain airports, the same as they maintain harbor and river facilities, have not kept up with the march of time in aviation. The one exception is Shanghai which now has an excellent municipal airport. There is no airplane made or probably ever will be made which cannot land on the municipal airport at Lunghwa with perfect ease and safety. This should be true of all the important cities in China.

Every city in China now being served by its two commercial aviation companies, C.N.A.C. and Eurasia Aviation Corporation should have airports of not less than 1,000 meters square, free of obstructions, well drained, and having hard surfaced runways and night landing facilities.

The importance of this cannot be over-emphasized. Commercial aviation in China to-day has reached the limits of its growth and efficiency with its present air fields. Further development will be retarded, in fact is now being retarded, until the air fields are improved to the degree required for the up to date flying now being done in China, and which will be done provided the needed facilities are provided.

It is encouraging to note that many of the cities in China are beginning to realize the vital importance of this work and it is confidently believed that our government and people will further extend to commercial aviation the hearty support they have given in the past. Given proper air fields and facilities, it is safe to prophesy that the progress made by commercial aviation in China during the past five years will be completely eclipsed by the progress made during the next five years.



View of the Yangtze Gorges from a China National Aviation Corporation Plane

The Bund of Shanghai, as seen from a C.N.A.C. Plane

The increase in mail and passenger traffic during recent years has enabled the company in 1935 to purchase three tri-motored Ford planes and two Douglas Transport planes. In the meantime the fleet of the company has been increased by one more Douglas Transport plane and before the end of the year flying boats (Sikorsky S-43) will be added to the company's flying equipment. The tri-motored Fords carry 10 passengers and have a cruising speed of 230 km. per hour. the Douglas Transport planes carry 14 passengers at a cruising speed of 300 km. per hour and the Sikorsky flying boat will carry 18 passengers at a cruising speed of 280 km. per hour.

The company is justly proud of its flying personnel consisting of ten American pilots and four Chinese pilots, whose ability is rated as equal in every respect to that of pilots in other countries. In addition to the above-mentioned fourteen pilots, the company has in its employ fourteen Chinese co-pilots whose training and experience form a valuable source of reserve for pilots at a future date. All of the C.N.A.C. pilots and co-pilots are trained in the use of direction finding and homing devices, these being the latest and most modern instruments available for better and safer operations.

With the introduction of larger passenger carrying airplanes, the company has been able to gradually reduce passenger fares on all lines. I give below a list of the reductions made, which vary between 10 and 40 per cent, and it is interesting to note that these

(Continued on page 205)

Waterworks Engineering in Tsingtao

By C. S. HSIN, Commissioner of the Bureau of Public Works, Tsingtao

WATERWORKS were first installed in China more than fifty years ago. When Li Hung Chang wished to protect the Bay of Chili by establishing a naval base at Port Arthur in 1879, he installed a waterworks there to supply the navy. This installation, which included 22,400 meters of 6-in. pipe, was the forerunner of all waterworks projects in China. This was a modest beginning.

The British in Shanghai organized a waterworks company for the supply of water to the British and French Concessions in the year 1882. Both the French and Chinese followed suit in their respective areas. The value of waterworks, therefore, became more apparent. From then on till 1911 Dairen, Tientsin, Tsingtao, Canton and Peiping followed in order. The capital of Yunnan Province introduced their waterworks in the year 1920. After the establishment of the National Government in 1927, cities such as Amoy, Wuchow, Nanking, Hangchow, Wuchang, Chungking, Nanchang, Tsinan, one after another introduced waterworks. Under the new Government this kind of development was greatly accelerated.

Now let us turn our attention to Tsingtao. The local waterworks does not rank as the greatest in China, but it has a long and interesting history. Because of our unusual topography and because of the sparsity of water in the regions adjacent to Tsingtao, the Engineering Department of the city faces more vexing problems than other cities.

View of the City seen from the Observatory Hill

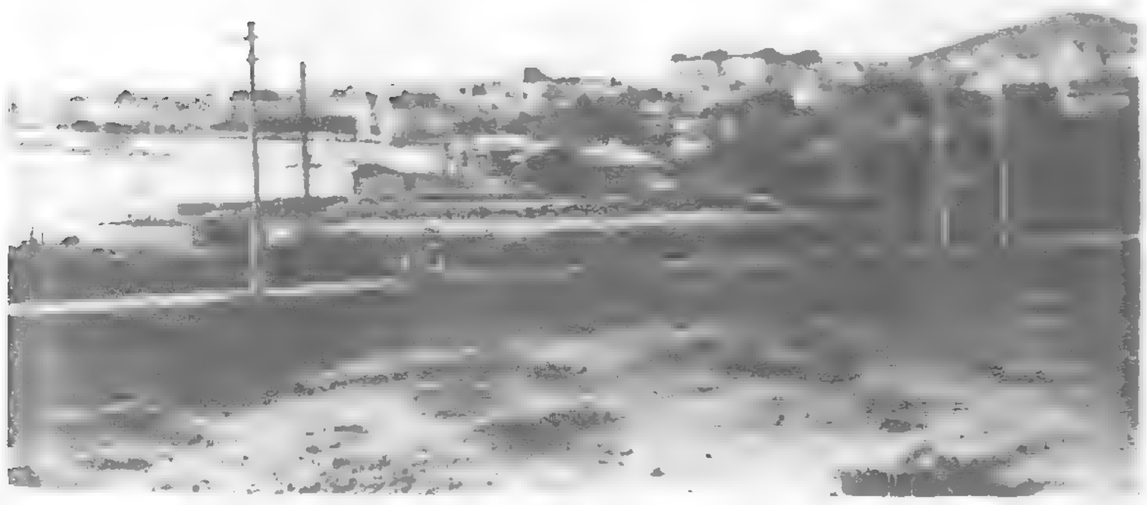
Survey of the Past

The German Government leased the Tsingtao Area in the year 1898. They inaugurated the waterworks at Hai Po River which was the nearest one to the new settlement. Wells were drilled and water was pumped from beneath the river bed and piped to the top of Observatory Hill where there was a reservoir of 400 tons capacity. This first project was completed in 1901. In the year 1905 the old wells were abandoned, the water supply being secured from newly drilled wells. This increased the supply from 400 to 1,000 tons per day. During the same year a waterworks was established on the Lits'un River supplying 2,000 tons of water a day. This second installation was completed in 1908.

In 1913 a reservoir of 2,000 tons capacity was constructed on the present Reservoir Hill. During the war the Japanese blew up the Lits'un waterworks. After the occupation the Japanese, rebuilt the Lits'un waterworks on a larger scale and thereby increased the supply from 2,000 to 5,000 tons per day.

In 1920 the Japanese built the waterworks on the Pei Shah River near Liuting with 4,000 tons per day capacity. This waterworks, built by the Japanese, is the Eastern Unit of the present waterworks at that place. In 1922 they built another reservoir of 4,000 tons capacity on Reservoir Hill. Since the retrocession of Tsingtao, the Chinese Government have enlarged the Pei Shah River waterworks and have thereby increased the capacity from 4,000 to 6,000 tons per day.

Despite this it was felt that this supply was still inadequate. The Bureau of Public Works therefore, built a Western Unit which was completed in 1930 with an additional capacity of 3,500 tons per day. But, because of the abnormally rapid growth of population and the increase of factories, the need for more water



Tsingtao, view from the Bund with Water-tower Hill in the background, right

View of the Iltis Huk

was so great that in spite of these developments we felt we were facing a water shortage. The chief reason for this was the small sized water-mains which made it impossible to supply more water by applying greater pressure because of the danger of pipe breakage.

Because of this situation in 1932 we effected plans of both temporary and permanent nature. Concerning the permanent plans, I will refer to them later. As to the temporary plans, the most important was the booster pumping station at Mengkou Road, where the water was released from the main pipe and re-pumped to the Reservoir Hill. This increased the flow without increasing the pressure on the pipes, so that an additional supply of 3,000 tons per day was secured. Thus, by the year 1932, the total water supply from the Pei Shah waterworks was increased from 6,000 to 9,000 tons per day. This booster station was completed in 1933.

In the year 1935 the second step of the temporary plan was carried out by constructing another booster pumping station at a point near the aerodrome which further increased the water supply from the Pei Shah waterworks from 9,000 to 12,000 tons per day. In addition, across the river from this booster station, we constructed a new waterworks unit called the Lits'un River Western Unit which supplied water from a few wells drilled there and piped to Tsangk'ow thereby increasing the Lits'un river waterworks supply from 5,000 to 9,000 tons per day. The present water supply from these several foregoing waterworks units supply the following amounts :—

Hai Po Waterworks	.. ..	2,000 tons per day :
Lits'un Waterworks	.. ..	9,000 tons per day :
Pei Shah Waterworks	.. ..	12,000 tons per day.

This makes a total maximum daily supply of 23,000 tons.

The total amount of water supplied last year was 6,340,000 tons making an average daily supply of 19,000 tons.

We have no records for the years 1913-14 of the German Administration, but in 1912 the average daily supply was 1,800 tons which is about one-tenth of the present daily supply. Towards the end of the Japanese regime in the year 1922, the average supply was approximately 8,000 tons which is less than one-half of the present daily supply.

Simultaneously the amount of distribution pipes within the city proper has also been increased. At present, they amount to 150,000 meters of which 60,000 were laid by the Germans, 36,000 by the Japanese, and the remaining by the Chinese. This last amount is approximately one-third of the total.

Street scene in Tsingtao

Nothing can be done without money. Since the retrocession of Tsingtao up to the present time we have spent $800,000 on the water system, more than half of which was used during the past five years. The Germans invested one million and a half dollars, and the Japanese two million and a half. When the Chinese will have spent $2,000,000 before the summer of 1938 in order to effect the first stage of the permanent plan, then the total Chinese expenditure will have amounted to $2,800,000. This first stage of our permanent plan has already been started which is evidence that the local Government is aware of the importance of waterworks development.

Future Plans

Now let me tell you something about this new permanent plan. This plan consists of (1) the construction of a dam at Yutek'ow connecting two hills lying opposite each other. The distance between them is 500 meters. All the water west of Laoting will be impounded within this dam. The reservoir thus formed will have a total capacity of 7,000,000 tons.

(2) *The erection of a purifying plant* at Huangpu three kilometers below the dam. Up to the present our water supply has been supplied from wells in the river bed so that it has gone through a natural filtration. On the other hand, this unfiltered water in the new reservoir will need purification.

(3) *The establishment of pumping stations.*—The water from the impounded reservoir will flow by its own gravity to Huangpu. After purification it will be pumped through a 650 mm. pipe to a reservoir on a hill near Ssufang. Work on this has already begun.

(4) *The making of a reservoir.*—The reservoir to which I have just referred will be situated on a hill near Ssufang and will have a capacity of 10,000 tons. Already five hundred laborers are working on this particular project.

And (5) *the laying of water pipes.*—From the dam at Yutzek'ow to the reservoir at Ssufang 23 kilometers of 650 mm. pipe will be laid. For the time being, 20 kilometers of this pipe will be used to transport water from Huangpu to the reservoir at Ssufang pending the erection of the dam and the purifying plant.

The ultimate cost of these five items of the permanent plan has been estimated to be $4,400,000. This calculation was on the assumption that it would only be necessary to excavate eight meters of the river bed in order to reach solid rock in the building of the dam. However, in 1933 we made a drilling test and found that it will be necessary to go down sixteen meters before we finally reach solid rock bed. This unexpected depth will increase the total cost of the permanent plan to $6,000,000. The cost of the dam alone will be $3,200,000. The raising of such an immense sum of money is very difficult. Last year it was decided to divide this permanent plan into two stages.

The first stage will cost $2,000,000 and includes the following :

(1) At Huangpu in the Pei Shah Ho river bed forty wells will be drilled.

(2) At the same point a new pumping station will be established.

(3) The twenty kilometers of pipe line which I mentioned will be laid from Huangpu to Ssufang.

(4) A reservoir of 10,000 tons capacity will be constructed on the hill near Ssufang.

(5) Twenty-eight thousand meters of distribution pipes will be laid down in Tsangk'ow, Ssufang, Tai Tung Chen, and Iltis Huk. This comprises the first stage. We are working vigorously and we hope it will be completed before the summer of 1938.

The second stage of the plan involving the construction of the dam and the purifying plant and the purchasing of the land occupied by farms and graves within the bounds of the projected impounding reservoir will cost $4,000,000.

Now, there may be some doubts which I anticipate and shall explain. Our projected Huangpu waterworks and the present Pei Shah Ho river waterworks are on the same river. Hence they naturally affect one another. We are making test drills on the near-by Chengyang river bed. The prospect of getting water from that region is very bright. We expect that the supply from this source will augment the water supply at the Pei Shah river waterworks which may possibly be effected by the addition of the new waterworks further up the river at Huangpu.

I will not dodge the problem of the present water shortage. It was unfortunate that we had a low rainfall during the latter half of 1936. At the same time the number of factories has been increased, making greater demands. Consequently a water shortage has come about before we have finished this first stage of our permanent plan. From some quarters there have been fears that the City Government have not adequately faced this problem. As a matter of fact, the water department have planned some emergency measures. Since last year the waterworks have been under the direct control of the Municipality. Nevertheless, the larger engineering problems and the so-called permanent plan of the water-

(*Continued on page 205*)

Wireless Communication Equipment in the "Kamikaze"

By TAKEKAZU YOKOGAWA, Staff Engineer, The Japan Wireless Telephone and Telegraph Co., Ltd.

"Where the Divine Wing goes,
"There shall be divine blessings, divine aid....."

WITH this refrain from a specially composed song of encouragement still ringing in their ears. Masaaki Iinuma. pilot, and Kenji Tsukakoshi. mechanic. of the *Asahi* monoplane Kamikaze took off from the Tachikawa Military Airdrome in the early dawn of April 6, headed for London.

As a skeptical world watched with astonishment, the Kamikaze roared on and successfully covered the distance of 15.357 kilometers between the capitals of the Island Empires of the East and of the West in 94 hours, 17 minutes and 56 seconds and thus set up a new world's record.

Few Japanese will forget the excitement and the pride that gripped the nation as the news of this achievement was received. Flags waved, crowds spontaneously intoned the national anthem and pandemonium reigned.

From an undertaking of a single newspaper, the flight became a national enterprise. It brought recognition to Japanese aviation and simultaneously served to forge another strong bond of amity between Japan and Great Britain.

Specially noteworthy was the fact that the airplane used was designed by Japanese engineers : built of Japanese materials by Japanese workmen : powered with a Japanese motor. and equipped with Japanese accessories. In brief. it represented the crystallization of Japanese ingenuity and scientific progress.

While due tribute should be paid to the ability of the Divine Wind's crew and to the sturdiness and endurance of the craft. we must not forget the part played by its radio apparatus.

Over the treacherous South China Sea. in the thickly-wooded Annam mountain ranges. and in the desolate deserts of Arabia. the wireless equipment served as the Divine Wind's nerves, guiding it unfailingly towards its objective and warning it of impending danger.

When forbidding cloud banks rose in its path, when deep fog held it in its treacherous embrace. when thunderstorms buffetted the frail craft. this wireless equipment served as its sole contact with the world and aided in guiding the Divine Wind safely to its goal.

From the moment it left Tachikawa. the Divine Wind established contact with the Choshi wireless station in Chiba Prefecture and reported its progress at regular intervals. This contact was successfully maintained until the Divine Wind reached Hanoi.

The Kamikaze. or Divine Wind. is a low-wing biplace high-speed monoplane built by the Mitsubishi Heavy Industries Co.. Ltd.. powered with a 500 h.p. Nakajima radial air-cooled motor of 500 h.p. In its tests. it developed a top speed of 500 kilometers an hour and is capable of making a 2.500 klm. non-stop flight. The engine was completely shielded.

The wireless equipment. a product of the Japan Wireless Telephone and Telegraph Co.. Ltd., is a 20 watt short-wave radio-telegraph set known as the NA 3 Model. Incorporated in it are features developed through many years of experimenting and experience with this type of apparatus. Its characteristics are as follows :—

Call letters J-BAAI
Total weight 26 kilograms
Effective distance 2,000 kilometers

A.—*Sending equipment :*

Output 20 watts A_1
15 watts A_2
Frequency 5.660 kc A_1 and A_2 } Crystal controlled
6,590 kc A_1 and A_2 }
Wave type A_1 and A_2
Key operation Positive keying in the amplifier stage

Tubes used :

Crystal oscillator	UY-47
Amplifier	UX-202 A in series or two
1,000-cycle oscillator	UX-12 A

A_2 wave control by means of grid control
A 20 watt output is possible for a short period after a forced landing.

B.—*Receiving Equipment :*

Four tubes : Frequency 20,000—2,000 kc.
2,500— 300 kc.

Tubes used :

High frequency amplifier	UZ 78
Regenerative detector	UZ 77
Low frequency amplifier	UY 37
Last stage amplifier	UY 38

The engine was provided with an electric noise eliminator.

C.—*Source of Power :*

Receiving and sending
High Tension D.C. converter. Manufactured by the Koana Manufacturing Co.
Second series 700-volts, 150 milliamperes
First series 24-volts
Revolutions 7,800 per minute.

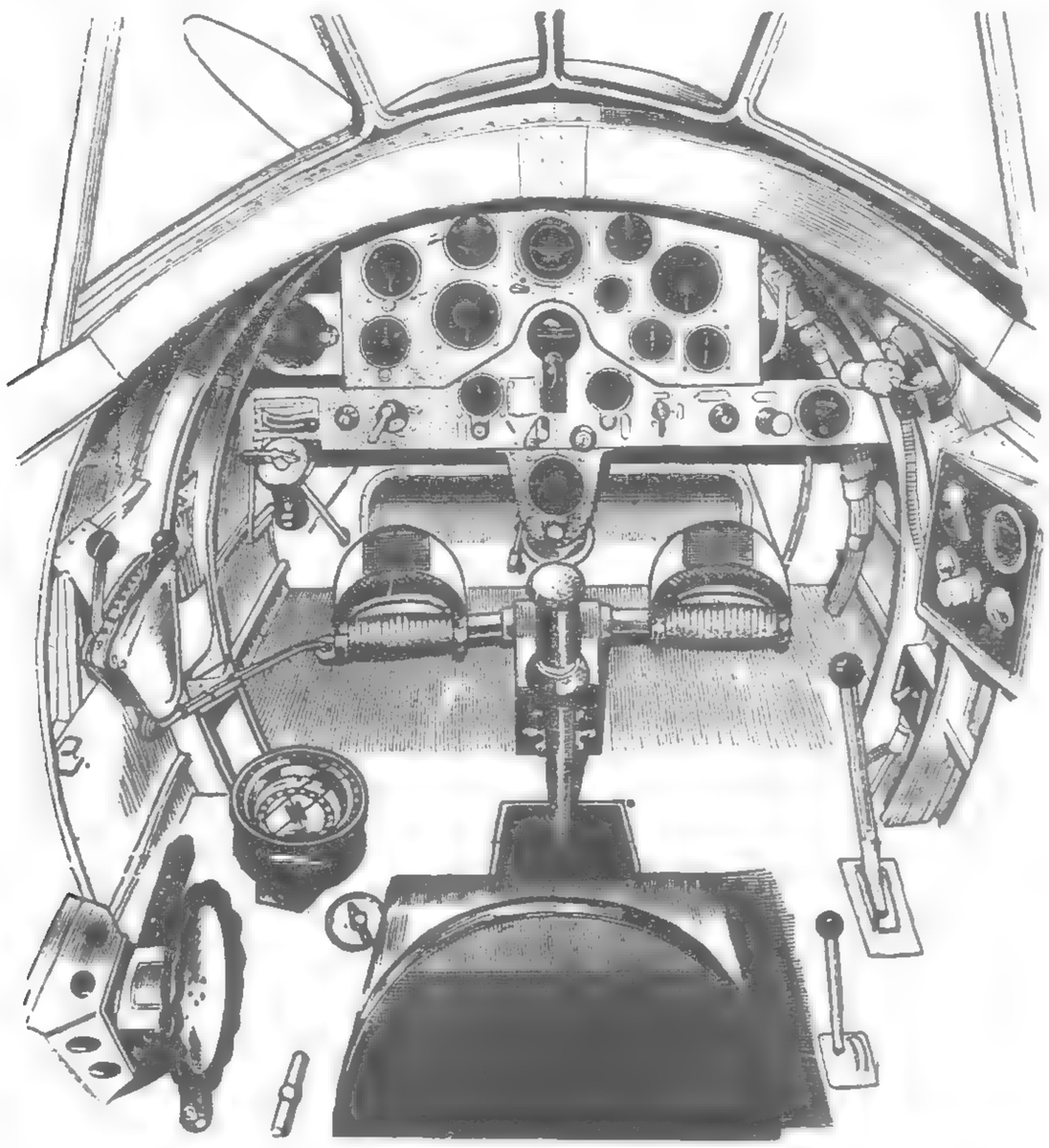
Low Tension—Connected to lighting circuit. Storage Battery 24-volts, 15 amperes. Charged by a generator connected direct to the motor manufactured by the Toba Electrical Manufacturing Co. and equipped with tension stabilizer. 25-volts. 14 amperes at 2,800-4,800 revolutions per minute.

D.—*Aerial :*

Fixed, inverted L ; 7 meters long.
Grounded to the fuselage.

Because of the high speed of the craft, several difficulties were encountered in designing the aerial. Major

The Asahi's fleet Mitsubishi made monoplane "Kamikaze" flown from Tokyo to London by two Japanese airmen in record time



Inside the pilot's cockpit of the "Kamikaze." Note, that the rudder-bar has loops over, and flat plates beneath, the toes

obstacles were: the limitations on weight and the air resistance created by a long aerial. Trailing and W-type aerials were ruled out as a result.

A single strand of wire was consequently strung horizontally above the machine between a streamlined vertical post at the head of the cockpit and the tail assembly. Insulators were also streamlined.

Because of the air resistance caused by windmill generators, the generator was hitched directly to the motor. This was the first time it was done in Japan.

Hitherto, dry batteries were commonly used to provide the high tension energy for the receiving apparatus, but because of weight considerations and the possible difficulties in obtaining new supplies, a D.C. converter was used for the purpose. It also supplied energy to the sending set.

Taking off from Tachikawa at 2 : 12 : 4 o'clock in the morning of April 6, the Kamikaze was successfully guided through a thick fog over the Loochoos to Taihoku by the radio contacts it maintained with the Choshi and Taihoku wireless stations.

After refuelling, the trim blue and silver monoplane roared off heading southwards over the difficult route to Hanoi. Off Hainan Island, in southern Kwangtung Province, China, it ran headlong into a thunderstorm, but aided by radio advices from Hanoi and Taihoku, it successfully reached its destination.

Continuing westward towards Rangoon, the Divine Wind was forced, by gathering darkness, to rest its wings at Vien-Tian on the Indo-China-Siamese border.

Although both Choshi and Taihoku operate on short wave, Hanoi, Rangoon and other stations to the west communicate in the intermediate waveband. The Kamikaze, consequently, used only its receiving set which permitted the reception of messages in these frequencies.

The second day was spent in a rapid dash in a tropical zone. From Vien-Tian, the Divine Wind proceeded to Rangoon, Calcutta, Johdpur and finally Karachi.

Another day was spent flying over torrid sand wastes, as the sturdy little machine pushed on towards its goal passing through Basra and Baghdad, to reach Athens by nightfall.

After brief stops in Rome and Paris, where they were enthusiastically welcomed, the two fliers arrived in London, on the fourth day after leaving Tachikawa.

Throughout the flight, which included non-stop jumps of a maximum distance of 2,200 kilometers, the Kamikaze maintained satisfactory contact with stations along the way, including those at both extremities of each lap. The stations contacted were as follows:—

Stations	*Call Letters*	*Wave Length Sending*	*Wave Length Receiving*	*Output kw.*	*Classification*	*Operating Hours*
Choshi ..	JCT	57 meters		1.0		
Taihoku ..	JFQ	317		2.0		
Hanoi	FRA	900-825-660	600-100-10 meters	1.5	CP	HX[2]
Kyatagong ..	VIC	900	900	0.5	CO	HX
Akyab ..	VTA	900	900	1.0	CO	HX
Rangoon ..	VTW	900	900	2.4	CO	HJ
Calcutta ..	VWC	900-600	900	2.4	CO	H24
Allahabad ..	VWA	900	900	1.0	CO	HJ
Delhi	VWD	900	900	2.4	CO	HJ
Johdpur ..	VWI	900	900	1.0	CO	HX
Karachi ..	VKW	900-600	900-600	2.4	CO	H24
Basra	VWI	900	900		CP	0300-2100
Baghdad ..	YIA	900	900	0.75	CP	H24
Athens ..	SWF	893	1200-900	0.15	CO	HJ
Rome ..	IKO	893-887	900	0.5	COCR	0500-1930
Alexandria ..	SVJ	900	900	0.5	CP	HJ
Almaza (Cairo).	SVM	900	900	2.0	CP	HX
Lyons	FNL	932-893 882-862	932-917-900	0.5	CP	0400-1830
Marseilles ..	FNM FOM	93 -882 862-893	932-917-900	0.5	CP	0400-1830
Paris	FMB	932-893 837-862-932	932-917-900	0.5	CP	141
London (Croydon) ..	GED	900-932 932-826	900-917-826	0.5		HJ

REMARKS:—CP Public CO Official CR Public Special HX Irregular HJ Daytime

In this flight half-way around the world, both the engine and the radio equipment were subjected to vigorous tests because of the violent changes in temperature, which included the heat of the Arabian desert, the oppressive dampness of Annam and the cold of more temperate zones.

In spite of the shortness of the aerial, dictated by the requirements of the machine, the radio equipment successfully operated on a frequency of 6,590 kc. to reach points more than 2,000 kilometers distant. This, frankly, was more than its builders expected.

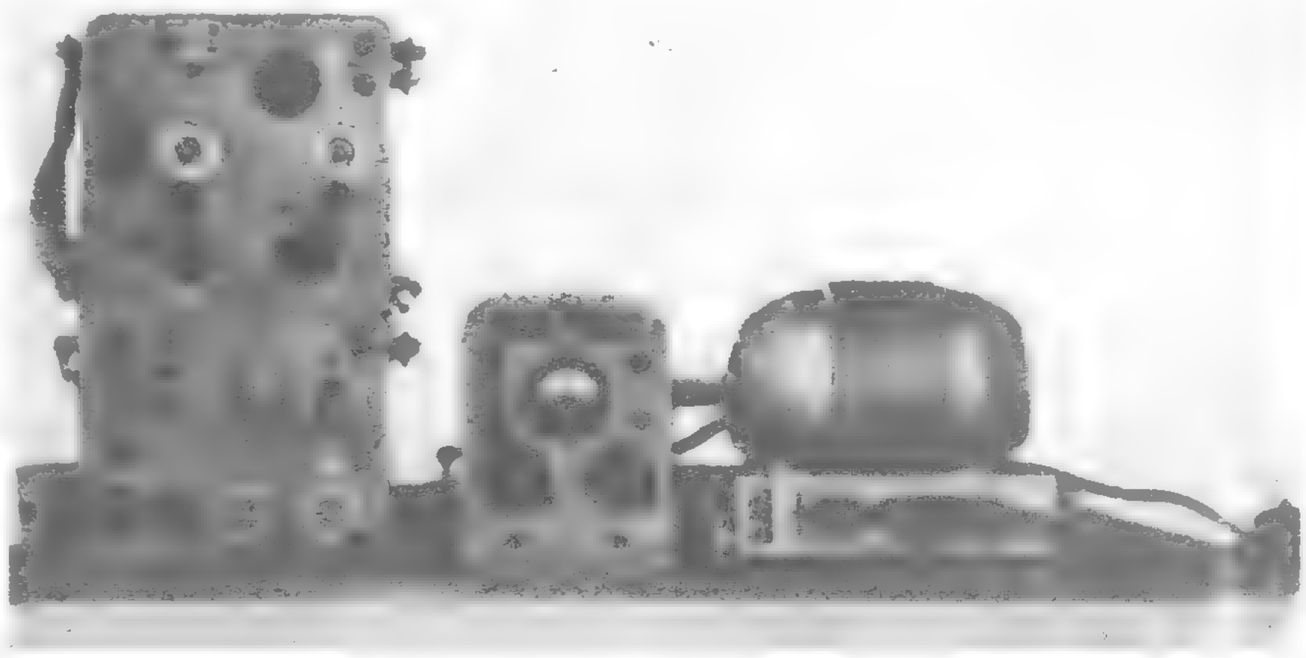
The wireless apparatus was passed by the Japanese Ministry of Communications in tests at the Haneda airport on March 27, and actually used in a training flight made by the Kamikaze from Tokyo to Kyushu on April 1, immediately after its christening. It then maintained contact with the Choshi and the Fukuoka stations.

* * *

Particulars of the "Kamikaze"

The leading particulars of the Mitsubishi all-metal low-wing monoplane "Kamikaze," in which Mr. Iinuma and Mr. Tsukagoshi flew from Tokyo to London, are of particular technical interest, says a report, appearing in *The Aeroplane*. It is rather smaller than the Northrop monoplanes it is popularly supposed to represent, its under-carriage is cleaner. The long narrow ailerons and short broad flaps which end far short of the ailerons are entirely original.

The 550 h.p. Nakajima Kotobuki motor seems, is a Japanese-built Wright Cyclone. The external finish of the machine appears to be very good indeed. The flush-riveting of both the wing and the fuselage is some of the finest we have ever seen. The whole



The body of the electric wireless communication apparatus of the "Kamikaze"

surface has been covered with many layers of clear dope so that not the slightest inequality can be felt.

On the wings, the riveting has been done in panels of about 6-in. by 4-in. with about 1½-in spacing between rivets. We were not able to get any information about the internal wing structure but it is probably of the multi-spar type.

Split trailing-edge flags extend underneath the fuselage to within about 3-ft. of each aileron. There seems no obvious reason why the flaps are not carried right up to the ailerons.

Landing lights, covered with transparent sections shaped to the wing-contour, are housed in the leading edge of the wings on either side of the fuselage.

Elevators and ailerons appear to have cotton fabric covering in the American manner. Trimming tabs on the trailing edges of the elevators can be adjusted while flying.

There are generous fillets between the wing roots and the fuselage in typically Northrop fashion. Rather cunning footsteps disappear into the fillets when not in use. The cockpit cover fairs prettily into the circular section fuselage.

The cockpits are about four feet apart and the fuel tanks are between them. Both cockpits are roomy and neatly arranged. The rear cockpit has two small windows let into each side at seat level. Dual control is not fitted. The normal rudder-bar and control column are in the front cockpit.

The pilot, Mr. Masaaki Iinuma, on the left and the mechanic, Mr. Kenji Tsukakoshi, on the right, of the all-Japan made monoplane "Kamikaze" broadcasting in Tokyo before they took off for their record hop to London

Dome-type navigation lights on top of the cockpit hooding and below the fuselage are perfect copies of a British make. We could not see that any British instruments were used.

The motor is enclosed in a conventional N.A.C.A. long-chord cowling without baffles between the cylinders. The exhaust collector ring is placed inside the cowling immediately behind the cylinders where it must impede the air flow considerably, and discharges above the wing on the port side. The hot gases had considerably seared the wing between Tokyo and London.

The airscrew appears to be a Japanese-built version of the Hamilton. The hub is concealed by a very fine spinner, an excellent example of Oriental attention to detail.

The undercarriage is neatly done and appears to be a distinct improvement on the Northrop model. It has a very long travel which was especially noticeable when the machine was landed at a high sinking speed and yet squashed down with not the slightest tendency to bounce. There is a small solid-tyred tail-wheel which is fully castoring.

Altogether the machine seems a robust job. The Heavenly Breeze after which it is called must be a pretty hearty built-in tail-wind because on only 550 h.p. the machine does not appear to have the performance which it has just achieved.

The principal characteristics are as follows: Span, 12 m. (39-ft. 4¾-in.). Length, 8.22 m. (27-ft.). Height, 2.8 m. (9-ft. 2½-in.). Wing area, 24 sq. m. (258 sq. ft.). Weight loaded, 2,000 kg. (4,410 lb.). Max. speed, 500 km.p.h. (310 m.p.h.). Range, 2,400 km. (1,490 miles).

Waterworks Engineering in Tsingtao

(Continued from page 202)

works are being done by the Public Works Bureau. The minor engineering work will be left to the Waterworks Department itself. These emergency measures consist of (1) the drilling of five new pipe wells at Hsi Liu Chuang which will augment the main water supply from the Pei Shah river waterworks.

(2) One brick well and two pipe wells are being drilled at Chang Tsun river to supply water for the Lits'un river waterworks. Besides we have another emergency measure which is being carried out by the Public Works Bureau. Water is now being secured during the process of well drilling at Huangpu. This water is carried by wooden sluices and sand troughs to the Pei Shah waterworks. This supplies an additional 5,000 tons a day. This plan is practically finished and the water shortage has thereby been relieved.

Finally, after the permanent plan is completely carried out, Tsingtao's total daily water supply will amount to from fifty to sixty thousand tons. That will be sufficient for double our present population and twice the number of factories which we now have.

Aviation In China

(Continued from page 200)

reductions have resulted in an increase in passenger business and receipts :—

Comparison of Fares on the Various Routes

Shanghai-Hankow :		
1929	$200	
June 15, 1934	$150	
Oct. 22, 1935	$120	Total reduction 40%
Hankow-Chungking :		
1930	$300	
Oct. 22, 1935	$240	Total reduction 20%
Chungking-Chengtu :		
1934	$100	
Oct. 22, 1935	$ 90	Total reduction 10%
Shanghai-Chengtu :		
1934	$550	
Oct. 22, 1935	$400	Total reduction 27%
Shanghai-Peiping :		
1933	$220	
June 15, 1934	$180	
May 14, 1935	$150	Total reduction 32%
Shanghai-Canton :		
1934	$270	
July 1, 1935	$220	Total reduction 18%

During the early pioneering years of the development of China National Aviation Corporation, the charges for airmail transportation were based upon a system of zones with an airmail surcharge of 25 cents per 20 grams per 1,000 kilometers.

On March 1, 1936, with the co-operation of the Chinese Post Office all zones were eliminated and a domestic rate was established for all points in China of 30 cents per 20 grams. While this constructive move has for the moment resulted in a temporary decrease in airmail revenue for the company, the elimination of the zone system was enthusiastically received by the users of airmail and the company confidently looks forward to a constantly growing volume of mail.

Electrically Driven "Craven" Machines for Workshops in India

SIMPLICITY of construction is a feature of a new electrically driven wheel boss facing machine and a light type wheel lathe which make use of an old principle in a novel manner. The former machine, known as an axle journal re-turning and wheel boss facing machine, " Craven," is the product of Messrs. Craven Brothers (Manchester), Limited, and was recently manufactured for the Bombay Baroda and Central Indian Railway : the latter, an electrically driven light type wheel lathe, called " General Purpose," was delivered by the same firm to the North-Western Railway of India. Both machines have been constructed in a new and unique form and are described in the following :

The electrically driven " Craven " axle journal re-turning and wheel boss facing machine, has been designed for re-turning and radiusing the outside journals of carriage and wagon axles, and for facing the outer bosses of the wheels, and is so arranged that the various operations can be carried out simultaneously at each end of the axle, i.e., journal re-turning or wheel boss facing without the removal of any tools. The axle is located at each end by " live " centers, and is driven from a central driving headstock with a special driver which can be quickly clamped to the axle.

The operation for entering the wheel set into the machine is very simple, the hinged top cap of the headstock and the split worm-wheel drive being so arranged that, by releasing the two locknuts, the complete cap can be swung over and the spindle and worm-wheel opened at the same time to receive the wheel set.

The saddles are fitted with front tool-rests, which carry the journal turning, radiusing, and boss facing tools, and provision is made at the rear of each saddle for the attachment of a burnishing apparatus of substantial construction if required.

The bed is of strong box section, cast in one piece with raised ends, having planed and surfaced ways to receive the saddles and movable headstocks. The gap at the center accommodates the wheel sets, with a planed surface in the gap for the center driving headstock. The front way forms a narrow guide for the saddles.

The two saddles have four self-acting longitudinal feeds in both directions which can be arrested by adjustable dead stops when the tools reach the end of the journals. A four-position turret tool-rest mounted on each saddle has four self-acting transverse feeds for facing the wheel bosses, during which operation the saddle is firmly secured to the bed by locking bolts. Again, adjustable dead stops can be set to trip the transverse feed. Hand adjustment is provided to the transverse and longitudinal motions for setting purposes.

The center driving headstock is fitted with a hollow spindle, split along the center line and flanged at one end to receive the driver. Before raising the top cap, it is necessary first to make the joint in the case and the joint in the spindle coincide, and then grip the top half of the split worm-wheel by means of a small locking handle. On releasing the two deep nuts on the cap, the center headstock can then be opened to receive the wheel set. For easy manipulation the cap is balanced and can be quickly raised and lowered.

The drive is by a constant-speed motor through a four-speed change gear box, directly coupled to the worm-shaft in the head-stock. The gears are of heat-treated steel running in an oil bath, the main shafts being mounted in ball or roller bearings.

The driver, which is attached to the flanged end of the spindle, is of special form having a hinged top member, and can be quickly clamped to the axle. The feed-change gear box obtains its drive from the worm-shaft in the headstock, and provides four changes of feed to the saddles.

The loose headstocks have large diameter adjustable steel barrels fitted with " live " centers rotating in ball and roller bearings. Efficient locking arrangements are provided to the barrels.

The lubrication has had special care, where possible " one-shot " pressure pumps have been provided : otherwise oiling nipples are fitted for use with an oil gun which is supplied with the machine.

The machine is supplied complete with pump, tank and connections for the cutting lubricant, one set of high-speed steel tools for journal turning, radiusing and boss facing, and the necessary handles and spanners.

The electrical equipment is supplied at an extra cost to suit individual requirements.

PRINCIPAL DIMENSIONS

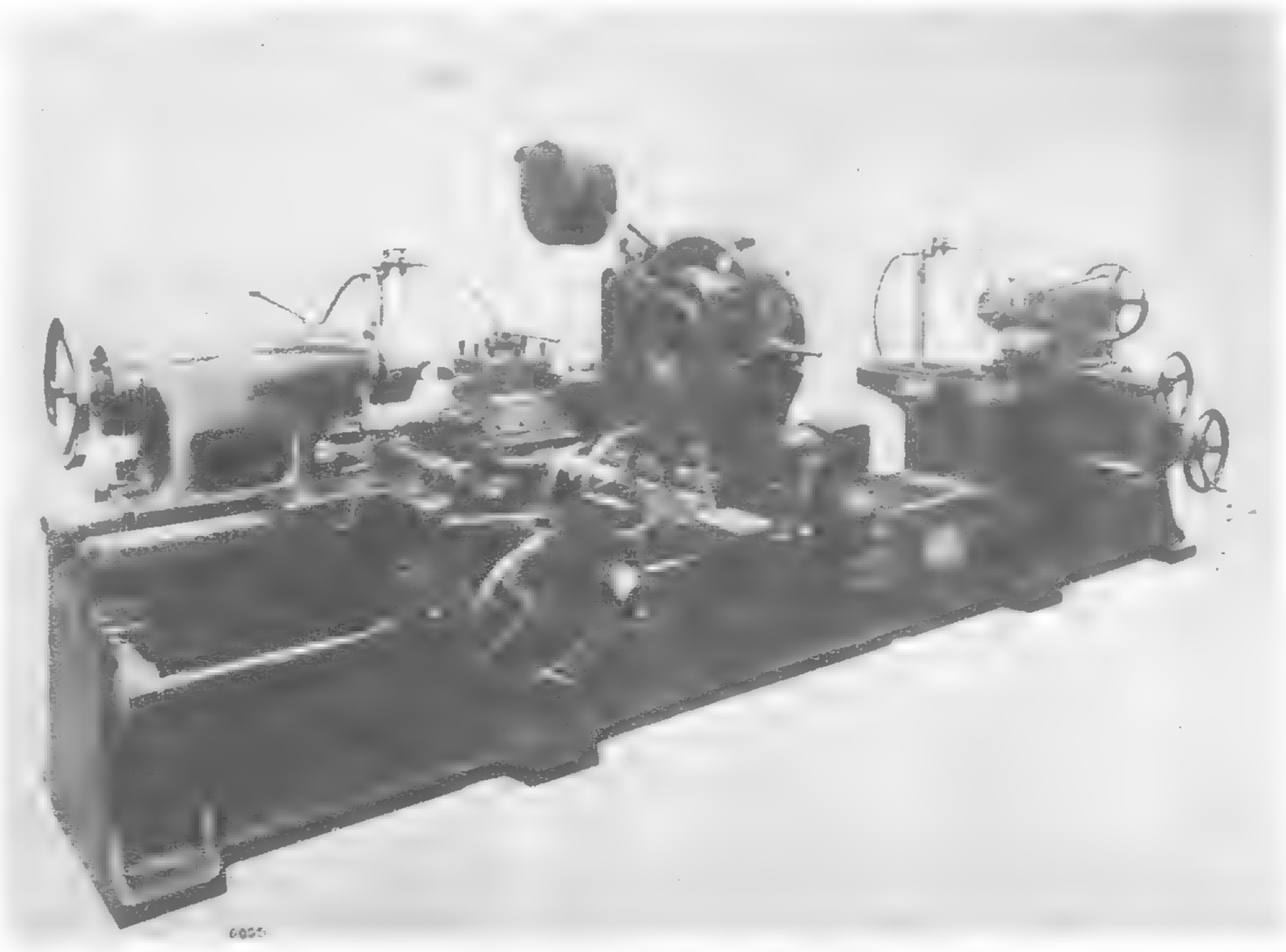
Height of centers :	1-ft. 1-in.
Will admit wheels in tread diameter up to	4-ft. 0-in.
Will admit axles in length up to ..	8-ft. 6-in.
Gauge of wheels admitted	5-ft. 6-in.
Length of bed	14-ft. 9-in.
Spindle speeds—revolutions per minute	14, 35, 45, 65
Self-acting feed traverse—sliding ..	1/10, 1/15, 1/22 and 1/32 inches per revolution.
—surfacing	1/20, 1/30, 1/44 and 1/64 inches per revolution
Main driving motor :	8 h.p.
Approx. weight exclusive of electrical equipment :	7½ tons.

Light-type " General Purpose " Wheel Lathe

This lathe is adapted for turning simultaneously a pair of railway wheels from 2-ft. to 3-ft. 3-in. diameter on the tread when mounted on their axle at 2-ft. 6-in. gauge. It will also turn the outside journals of axles with the wheels mounted, and turn axle journals and wheel seats from the black forgings, one end being turned at a time.

The main drive is by a two-speed alternating-current motor giving 35 h.p. at 1,440 r.p.m., or 17½ h.p. at 720 r.p.m., and driving through three-speed change-gear box, direct connected through spur gearing at end of bed to the main driving shaft, which is carried in a pocket along the front of the bed.

Both headstocks have a spindle running in parallel capped bearings with gunmetal steps, the front bear-



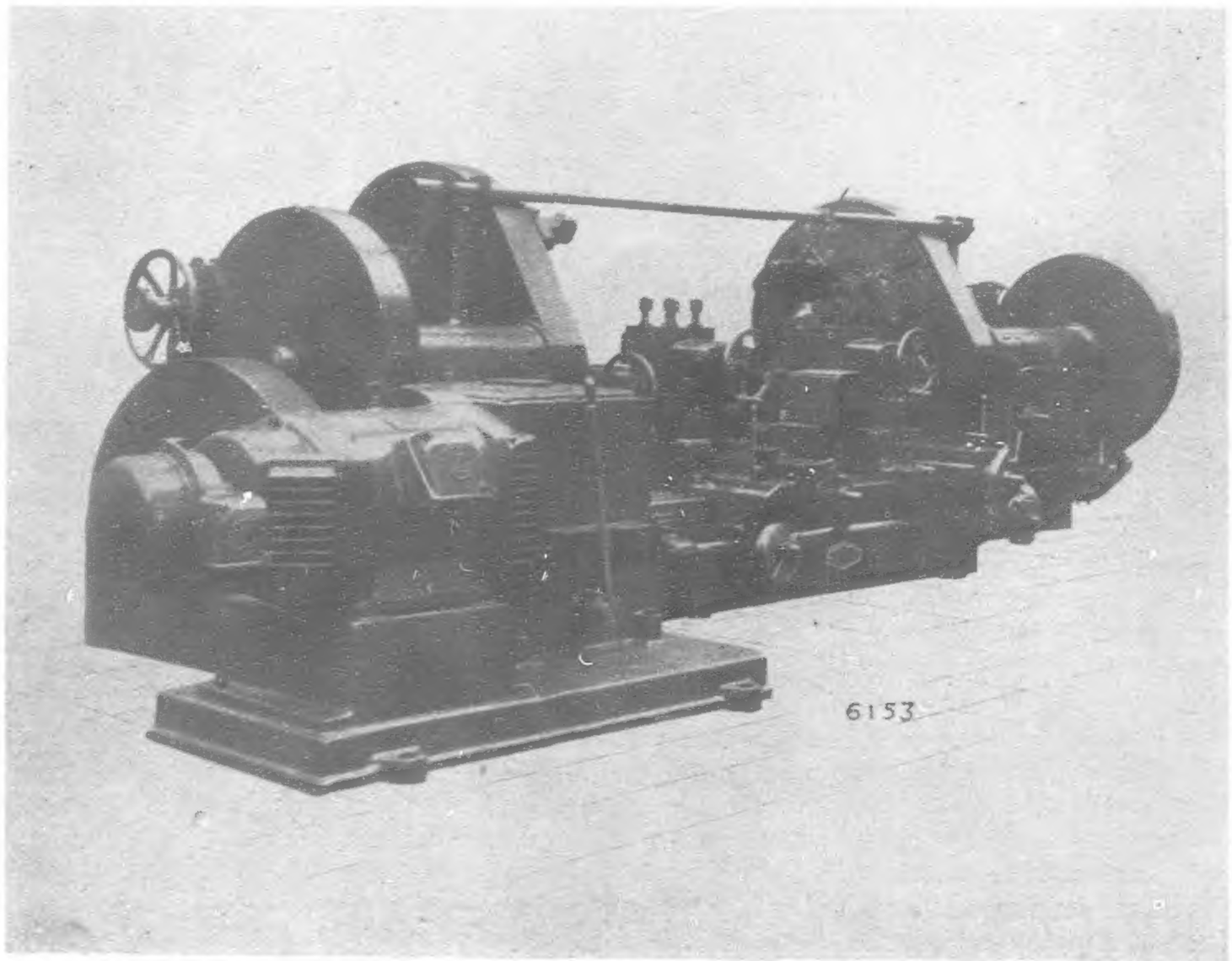
Axle Journal Re-turning and Wheel-Boss Facing Machine

ings being 10-in. diameter by 13-in. long, and those at the back 8-in. dia. by 10-in. long, ball thrust washers taking the end pressure.

Each spindle has a sliding steel barrel, adjustable by hand-wheel at the tail end and having efficient locking device. The movable headstock is adjustable along the bed by a 5 h.p. reversing motor at the end of the bed through reduction gearing and slipping clutch to a screw in the bed, and, when adjusted, the headstock is locked in position by a hand-operated quick-acting clamping device.

The pinion on the main shaft for driving the faceplate pinion shaft of the movable headstock is disengageable for use when turning journals, so that the drive to the axle or the wheel-set then only takes place through the driving headstock.

Spindle speeds are provided for turning wheels from 2-ft. to 3-ft. 3-in. diameter over the tread at cutting speeds of about 10-ft. to 18-ft., so that hard or soft tyres can be turned. An additional range of quick speeds is provided for boring tyres and turning journals. The faceplates are 3-ft. 9-in. diameter with external spur driving rings secured at the back, each being provided with three side drivers with clamps, and also with three adjustable jaws in slides for use when boring tyres.



Electrically Driven Light-type General Purpose Wheel Lathe

There are two compound slide rests mounted on stiff saddles, the left-hand saddle being moved along the bed by pinch rack, while the right-hand one is adjustable longitudinally by hand or power feed motion through rack and pinion. The rests are adjustable transversely on the saddles by hand or power feed motion, and similar motions are also provided to the tool slides along the swivel slides which are fitted so that the rests can turn the taper required, and thus the transverse feed is maintained at right angles to the axis of the machine, while the longitudinal feed is set to the angle required. Feed motion is derived from a rocking shaft at the front of the bed through ratchet boxes.

Each rest carries a tread and flange roughing tool and a full profile and chamfering tool bolted to the top of the rest, so that no changing of tools is required when turning wheels, except for re-grinding the tools or side cutting the tyres. An adjustable pin gauge is provided for calipering. It is carried from bars fixed above the headstocks.

Push-button stations are provided for controlling the various motions. Lubrication to the working parts is by one-shot pumps; where this system is not applicable, oiling nipples are fitted for use with an oil gun. The lathe will admit axles up to 6-ft. 6-in. long overall, and its net weight, exclusive of electrical equipment, is 21 tons.

ROLLING STOCK FOR CHINESE RAILWAYS

(Continued from page 187)

arranged with a sorting table on the bodyside complete with four tools of the swinging type.

Dining Car

The dining cars comprise one main saloon, a cashier's room and corridor, a pantry and a kitchen. The main saloon is provided with twelve removable tables, six to seat four passengers each, and six to seat two passengers each, the total seating capacity being for 36 passengers. The interior finish of the saloon, corridor and cashier's room is of mahogany faced plywood panels, and polished mahogany mouldings, all finish of partitions being flush, as for the day cars. Bracket lights and bell pushes are arranged at each table. The pantry is fitted with a sink, having hot and cold water supply, and ice-boxes on the corridor partition side with cupboards above and below. Access to kitchen from the pantry is by means of trap doors immediately under the serving hatchway arranged in the transverse partition between these two compartments, whilst there is also access to the pantry by means of a swing door from the cashier's room. Access to the kitchen is also obtained by means of a sliding door from corridor and a swing door from bodyside.

Sleeping Car

The first class sleeping cars are divided into eight double compartments, with an attendant's room and a women's lavatory at one end and a men's lavatory at the other, a corridor running the full length of the car. Each compartment has a transverse lower berth and longitudinal upper berth, arranged above the bodyside window, the lower berth being so arranged that the upper portion can be hinged up to form a seat-back for day use, the seat portion being a fixture and giving extra resilience to the berth. The upper berth is arranged to hinge upwards and to form part of the interior finish of the car in the daytime, the underside of the berth being panelled to match the interior. All berths and seats are upholstered with good quality hide of a shade to harmonize with the teak interior finish. Each car has accommodation for 16 passengers.

The arrangement of the second class sleeping car is on similar lines to the first class car, with the exception that it has five double compartments, two single compartments and a washroom. Each double compartment has two upper and two lower berths arranged on the transverse partitions, and the single compartments one upper and one lower berth, the total number of berths being 24. The lower berth is made up of a loose spring cushion on a timber framing supported at the bodyside and longitudinal partition, while the upper berth is arranged to swing down to form a seat-back for day use, and is supported by brackets on the bodyside and longitudinal partition for night use. The berths are upholstered in "Rexine" of green shade. The hot-water supply in the case of both the first class and second class sleeping cars is supplied by Westinghouse heaters fitted to each basin and fed by steam from the main steam line. The water supply for third class sleeping cars, second class day and sleeping cars, baggage and guard's and baggage and mail vans is from tanks arranged in the roof at the end of the cars, with filling from platform or roof, whereas the supply for the first class sleeping cars and dining cars is from an underframe water tank, and thence by J. Stone and Company's water raising apparatus. The exterior sides of the coaches are finished in purple brown below the waist with a blue waist line and buff from waist to cantrail. The ends are finished in purple brown and the lettering and numbering are in gold transfers.

Harmonic Induction

New Diesel Engine by Petters Limited

As is well known in the design of organ pipes, the frequency of waves in the exhaust pipe, i.e., the number of waves per second is governed by two factors, the length of the pipe and the speed of sound in the medium in the pipe. This principle has been applied for the first time to the exhaust system of a Diesel engine.

During the week ending December 12, last year, a demonstration was held at Burwood House, Caxton Street, Westminster, London, of Petter Harmonic Induction Engines operating on this principle, in which the clean air required to re-charge the cylinder before each piston stroke is sucked or drawn in by means of a vacuum produced by the wave motion created in the exhaust pipe.

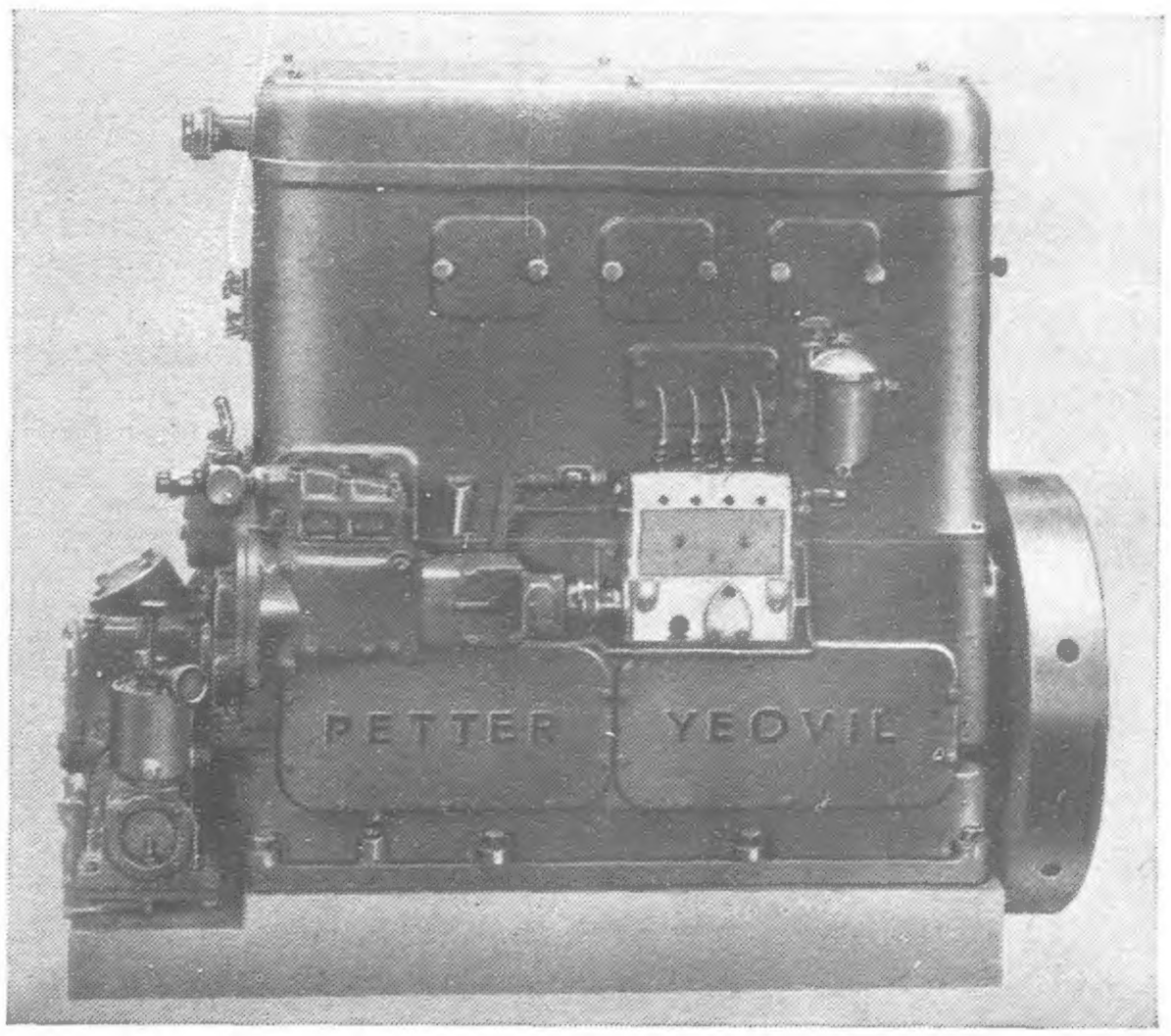
All the exterior methods generally employed to refill the cylinder with air, such as the auxiliary compressor or blower of a two-stroke or the idle strokes of a four-stroke engine are eliminated. In addition, a more complete degree of scavenging is attainable than is usual with a two-stroke cycle engine. As a consequence, approximately 50 per cent more power is developed with a given cylinder volume than in a standard engine, thus reducing the power-weight ratio.

Engines of this type of 1, 2, 4, 6 and 8 cylinders of 16 b.h.p. per cylinder, suitable for all stationary purposes and for locomotives are now in production.

The Petter Harmonic Induction Engine

The Petter harmonic induction engine is the successful application of a principle which has been known to engineers for many years.

The intended interpretation of the word "Induction" is that the fresh air which is required to re-charge the cylinder before each stroke of the engine instead of being pumped into the cylinder as in the case of a normal four or two stroke engine, is drawn or sucked in by means of a vacuum which is produced as a result of the wave motion in the exhaust pipe.



64 b.h.p. Petter Harmonic Induction Engine

Research into the phenomenon of the wave motion in the exhaust pipe of an internal combustion engine commenced as early as 1893, but it was not until 1922 that the first experiments were carried out by Petters Limited, Yeovil, England, on this system.

The results obtained then were not considered very promising, and work was discontinued until recently, when a new series of experiments was conducted, from which remarkable practical results have been obtained. These latter experiments were carried out on a two-stroke-cycle engine, the air inlet ports being arranged circumferentially around the cylinder bore at the lower end of the piston travel. The exhaust valve was situated centrally in the cylinder head, thus the air entered the cylinder at one end whilst compressed by the piston to the other end of the cylinder, and was ejected from the cylinder at the end to which it was compressed, thus providing means for keeping the air flowing in one direction through the cylinder.

When the exhaust valve in the engine opens, the sudden ejection of the burnt products of combustion from the cylinder into the exhaust pipe sets up a wave motion in this pipe. This motion is similar to the motion of the waves produced in an organ pipe, the initial compression wave being formed by this sudden ejection into the exhaust pipe. Immediately following this compression part of the wave, there is a vacuum or rarefaction part which completes the wave cycle. This rarefaction is transmitted from the exhaust pipe through the exhaust port into the cylinder, and at exactly the right moment the ports in the cylinder connected to the atmosphere are opened, thus connecting the vacuum in the cylinder to the pressure in the atmosphere, the result of this being that the clean air rushes in from the atmosphere and fills the cylinder completely, thus the cycle of operations in the cylinder may be repeated.

As is well known in the design of organ pipes, the frequency of the waves in the exhaust pipe, i.e., the number of waves per second, is governed by two factors; they are, the length of the pipe and the speed of sound in the medium in the pipe. As the latter of these is fixed by contingencies which are not under the control of the engine designer, it is important that the right length of pipe is used in order that the waves in this pipe are timed correctly so that they coincide with the opening of the exhaust valve and the opening of the air ports, i.e., at the moment that the air ports of the engine open, it is necessary to have the vacuum in the cylinder, therefore, it will be seen that for any particular speed of operation of the engine there is a definite length of exhaust pipe required. Fortunately, once the length of exhaust pipe has been fixed, the speed of operation of the engine is not absolutely rigid, and a certain amount of flexibility is obtainable. The result of this method of filling the engine cylinder with fresh air at each stroke of the piston is that it is possible to do away with all the usual methods of refilling an engine cylinder with air, i.e. the idle strokes of a four stroke cycle or the auxiliary compressor of a two-stroke cycle engine.

The engines which are being demonstrated will show the design of the four, twin and single cylinder units. The length of the pipe between the cylinder head and the exhaust chamber is the important length of pipe already referred to, which has a similar function to that of an organ pipe on an organ, and in which the wave motion takes place. It is of interest to note that it is possible to connect the exhaust from two cylinders into one pipe as the functions in the pipe take place at an interval of 180°, and it is possible to coincide the motions in the two pipes to work together. The multi cylinder engines are of monobloc construction with separate cylinders which are easily removable for re-boring.

The exhaust valve already referred to which is situated in the cylinder head, is operated from the camshaft which is gear driven from the main crankshaft. The fuel injection nozzle has a single hole, centrally placed, which is of relatively large diameter, and therefore remarkably free from the danger of being choked by carbon deposit. Since the wave motion in the pipe only functions above a certain speed of the engine, there is an auxiliary device whereby air is supplied to the engine for starting from the crankcase, but once the engine has run up to speed the automatic scavenge system operates of its own accord.

The advantage of the method of scavenging adopted is that not only are all exterior methods of supplying air to the engine removed, but more complete scavenging of the engine is effected than is usually obtainable in a two-stroke unit, so that approximately 50 per cent more power is developed per cylinder volume than in a standard two-stroke engine. This has the effect of lowering the power weight ratio of the unit.

Engineering Notes

SHIPPING

HULUTAO HARBOR.—Work on the development of Hulutao Harbor, resumed on October 26, is expected to be completed within five years, at the cost of Yuan 20,000,000.

JAPANESE SHIPPING.—Authoritative figures show that ships of over 1,000 tons, building in Japan's shipyards, total 118 vessels aggregating 733,400 tons, including six vessels totalling 16,000 tons ordered from abroad.

Freighters top the list, numbering 87 with 507,000 tons. Passenger boats number 15 with 82,000 tons, oil tankers seven with 67,000 tons and whaling depot ships, three with 62,000 tons.

SINGAPORE HARBOR WORKS.—Rapid progress is being made on the Singapore harbor extension scheme, which is to cost £1,200,000. With the completion of the new wharves, Singapore will have one of the most imposing dock-lines in the East, extending over three miles. Two of the wharves will be ready for use early next year, and the whole undertaking will be completed in 1938. Giant cranes are now handling the 20 ton blocks of concrete forming the foundations of the wharves.

ELECTRICAL

STEAM POWER.—Plans for the establishment of a joint steam power generating company for the Nagoya district of Japan have been completed, and it is to be founded with a capital of Y.15,000,000 and a capacity of 150,000 kw.

POWER FOR KOREA.—Mr. Nobuteru Mori, head of the Japan Electric Industry Company, the largest manufacturer of aluminium, and of the Showa Fertilizer Company, which has Japan's largest plant for making ammonium sulphate, has applied to the Korean Government-General for permission to start an extensive electric power industry near Shingishu, on the Yalu River. He would put up a Y.40,000,000 power station generating 200,000 kilowatts to supply to various industries in North Korea.

TIENTSIN ELECTRIC PLANS.—In anticipation of development of Japanese industry in North China, the Electric Power Federation, consisting of Japan's "Big Five" power companies, has decided to invest 2,000,000 yuan in the Tientsin Electricity Company. Although steam power generation in Peiping and Tientsin involves only 100,000 kilowatts, the Federation intends to begin at Tientsin with the erection of a steam power plant capable of generating 30,000 kilowatts and costing Y.8,000,000, a joint investment by the Tientsin City Office and the Federation. Mr. Shinji Sogo, president of the new company, recently called on Sir G. B. Sansom, Commercial Counsellor of the British Embassy in Tokyo, in connection with the Tientsin company's plan of buying Kaiping coal from the Kailan Mining Administration at Tientsin, under British management, for use in the new plant.

MINING

JAPAN WANTS MORE COPPER ORE.—The director of the mining interests of the big Japanese Ishihara concern (originally purely a shipbuilding enterprise), who has paid a visit to Java, announces that the company intends to work copper ore in Southern and Middle Java.

LUNG YEN MINE.—Mr. Lu Chung-yu, newly-appointed director of the Lung Yen Iron Mining Co., has discussed the development of the Lung Yen mines with the Japanese authorities. Mr. Lu said that at least $5,000,000 was needed to re-float the mining company, which has been idle for eight years, and, if the iron foundry at Shihchingshan is to be put to work again, at least $20,000,000 would be required. How to raise this money is the big problem under discussion.

IRON ORE FOR JAPAN.—A formal agreement will, it is reported, shortly be signed between the Japan Mining Company and Mr. T. V. Salt, Engineer and Representative of H. A. Brassert Co., Ltd., London, for the exploiting of iron ore deposits on the Yampi Sound, North-West Australia, where Brassert's has bought certain leases.

It is understood that the agreement provides for the formation of a joint Anglo-Japanese concern by the Japan Mining Co. and Brassert's which will advance about Y.6,000,000 to the new mining company. This company will be formed in Australia as a subsidiary of Brassert's, to exploit the Yampi leases.

RAILWAYS

RAILWAY LOAN.—The Ministry of Railways is approaching Czecho-Slovakia for a loan of approximately $6,000,000 in the form of railway materials for improving the Hangchow-Yushan section of the Chekiang-Kiangsi Railway in process of construction. The report says that negotiations have been carried out favorably. The loan will be returned after seven years, at an interest of four per cent. As to other things to be mentioned in the loan agreement, they will be similar to those mentioned in another agreement signed by the Ministry with a German firm in connection with the construction of the Nanchang-Pinghsiang section of the proposed railway. This section is expected to be completed next March.

INDUSTRIAL

WOOL FACTORY.—The South Manchuria Railway is building a big wool factory in Kalgan, and a large quantity of wool has already arrived from Mongolia for the mill.

DIESEL MOTOR CARS.—Japan Diesel Industry Company, Tokyo, has decided to establish the Second Japan Diesel Industry Company, with a capital of Y.14,000,000, to manufacture automobiles equipped with Krupp-Junker Diesel engines.

JAPAN SUBSIDIZES TEXTILES.—Japanese exporters of textiles, cotton and silk goods, are combining to form a £10,000,000 fund to subsidze the purchase of South African and Argentine wool, both of which are dearer than Australian.

FERTILIZER PLANT.—Mr. Nobuteru Mori, head of the Showa interests, is planning the construction of a large ammonium sulphate manufacturing plant at Shingishu, Korea, to produce 100,000 metric tons of ammonium sulphate a year.

JAPAN BUYS BIG COTTON MILL.—The Yu Yuan cotton mill, the largest Chinese mill in North China, has passed into the hands of a Japanese concern. The mill recently went into receivership owing to financial difficulties. It possesses 70,000 spindles, and is expected to reopen shortly.

CEMENT WORKS.—Preparations are being made by Japanese to establish a big cement factory in Tongshan, the mining town on the Peiping-Liaoning Railway. The concern, it is learned, will be capable of producing twice the output of the Chee Hsin Cement Company, the largest Chinese-owned business of its kind in North China.

AMMONIUM SULPHATE IN CHINA.—The ammonium sulphate plant of Yung Lee Chemical Works (Chinese), at Pukow, across the river from Nanking, is nearing completion and is expected to start operations shortly. The company has issued 5,500,000 yuan debentures for refunding bank financing loans extended by five leading banks.

JAPANESE AMMONIUM SULPHATE.—The Japanese Industrial Company, Ltd. (Nippon Sangyo K.K.), has commenced the erection, in Formosa, of a factory for the production of ammonium sulphate. This factory will later be made an independent company with a capital of 20 million yen. The planned output of the new works is 100,000 tons of ammonium sulphate a year.—The Showa Artificial Silk Company (Showa Jinken K.K.), which had intended making ammonium sulphate as a by-product, has now abandoned the project.

OIL REFINERIES.—Construction of two refineries to produce gasoline has been approved by the Tokyo Commerce and Industry Ministry. The Nippon Oil Company will build a refinery at Amagasaki capable of producing 87,000 metric tons of gasoline annually. The Japan Mining Company is to erect a plant with a capacity of 23,000 metric tons annually.

JAPAN'S STEEL PRODUCTION.—Japan steel production, this year, is likely to exceed 4,000,000 tons, for the first time in the history of the industry, the estimate being 4,200,000 tons. In the first six months of the year the output of steel was 2,159,000 tons, compared with 1,917,000 tons in the same period last year, and of pig iron 1,069,000, tons compared with 1,046,000 tons.

LARGE MUSEUM.—Plans to build a large museum in Tokyo by 1940, the 2,600th anniversary of the founding of the Japanese Empire, are taking shape after three years of discussion. It is pointed out that the Tokyo Museum of Science, Ueno, is meager compared to the British Museum, London, the German Museum, Munich and the Metropolitan Museum of Natural History, New York, and it is hoped to have a museum worthy of Tokyo. The scheme calls for enlargement of the present structure of 2,600 *tsubo* to one of 8,000 *tsubo* by the addition of two four-story wings.

COAL LIQUEFACTION.—A three-year plan for establishment of a national coal liquefaction industry has been advanced by the Tokyo Commerce and Industry Ministry, which, if the Diet approves, will be enforced in this coming fiscal year. The Ministry would build a factory to produce 20,000 tons of oil annually, the minimum for economical production. The initial expenditure would by Y.5,000,000, but Y.17,000,000 has been set aside for the project. A feature of the proposal is that the factory would be equipped to produce oil by three methods, namely, low carbonization distillation, hydrogenation, and gasoline synthesis.

JAPANESE SPINNERS EXPANDING.—Fuji Gassed Spinning Company, one of the "Big Five" of Japan, will issue debentures for Y.5,000,000 shortly to enlarge the quipment of the Tsingtao mill of the Manchuria Spinning Company. Further expanding its activity in North China, Fuji Spinning will shortly buy 100,000 *tsubo* of land at Tientsin for construction of a new mill. Kanegafuchi Spinning Company is to raise more than Y.20,000,000 to expand its factories and operate six woollen mills owned by the Godo Woollen Textile Company in preparation for purchase in the next five years. This company already has purchased two Chinese mills in Tientsin, Yu Yuan and Hua Hsin. Kanegafuchi also has decided to manufacture pulp out of "Kangte reeds" grown abundantly at Newchwang and along the gulf of Liaotung, and to construct a pulp factory in the Sankuoshu industrial district near Harbin, using reeds grown along the Sungari River to manufacture pulp for rayon making.